THE FOUNDRY

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Typical American Foundry Centers.

While a natural location is supposed to play a most important part in the success or failure of any industry, it seems a foundry can with impunity be started anywhere, provided it is surrounded with sufficient population to consume the articles it manufactures.

No one would dream of starting a blast furnace away from the beaten track of coke, ore and lime-stone. True it has been tried but the dismantled stacks are a fair warning to others not to repeat the experiment. Then we are wont to imagine that large enterprises must be located where the best of transportation facilities are provided by rail and water. When we look at some of the groups of foundries scattered throughout this country we will find that these rules have been more or less ignored. We will find that one foundry after another has been started until the cluster has assumed formidable proportions.

One of these inland towns that poses as a prominent foundry center is Springfield, Ohio. In the number of foundries within its border this city ranks third in the state of Ohio, Cleveland being first with 38, Cincinnati second with 27 and Springfield third, having 23 places where iron is melted.

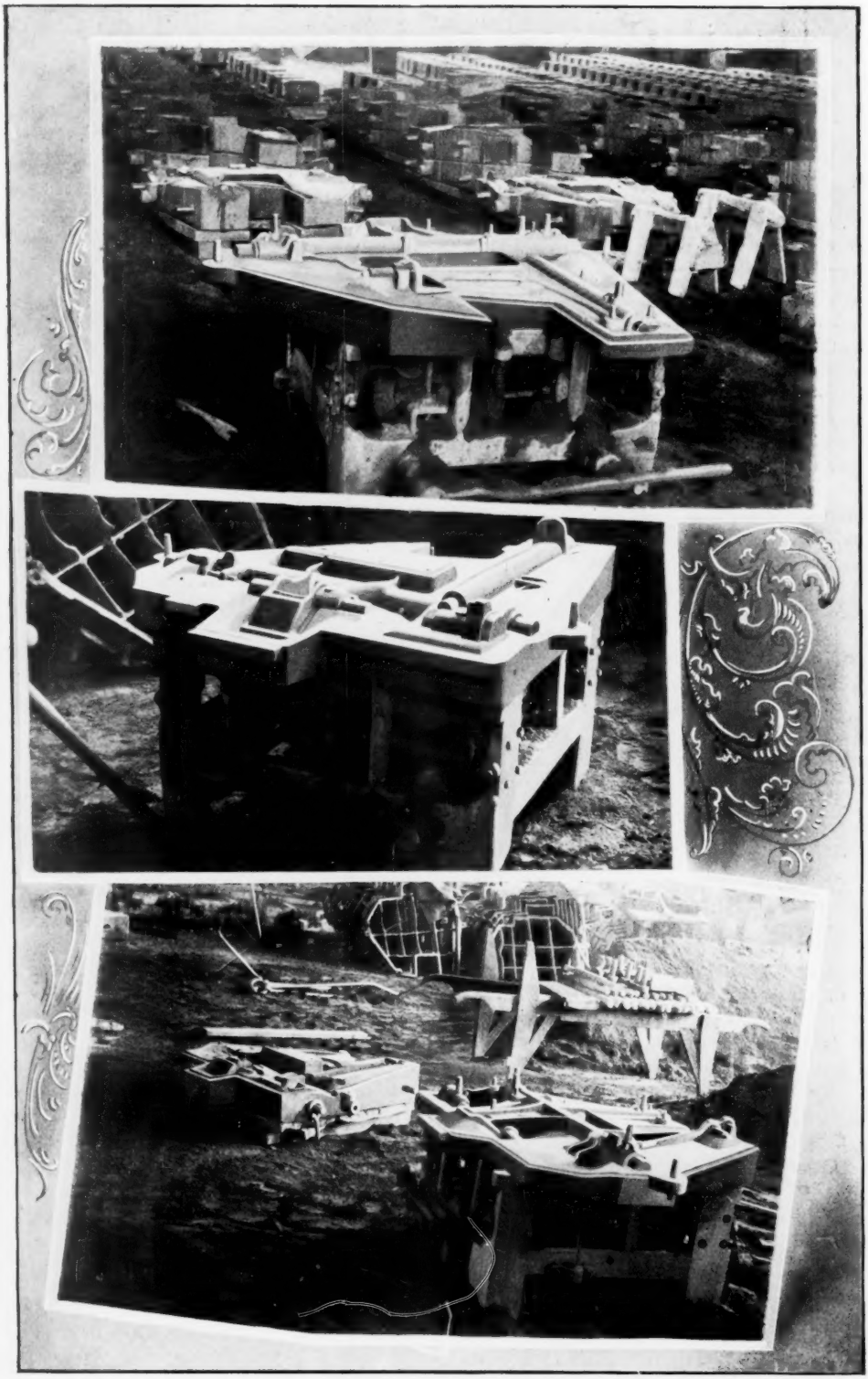
We can notice no special advantage which the location of the last named place offers a foundry. It seems as if almost any other part of the state of Ohio would be as suitable for this particular trade. Again Springfield is interested in every branch of the foundry trade on account of the great variety of castings turned out by its shops. While it is a common occurrence to find several foundries in one town turning out the same class of goods Springfield is one of the most diversified foundry centers in this country. The apprentice who leaves Springfield, Ohio, without becoming a competent molder can certainly have nobody but himself to blame.

The impetus given to the foundry business within the past eighteen months could not be more visible than right here. Nearly every shop has made additions to its foundry, several concerns formerly buying their castings have erected shops of their own in order to supply themselves more promptly, and we have a strong suspicion that at the same time they have aimed to obtain a grade of castings more suitable to their particular work than they could purchase in the open market. Added to this is also the fact that it has been an object to reduce the cost of their castings, and to this phase of the subject we will refer later.

What is probably the largest foundry in Ohio is operated by the Warder, Bushnell & Glessner Co., of which the late Charles A. Bauer was manager for many years, the same position being now occupied by his son Chas. L. The elder Mr. Bauer was one of the best known managers in the United States, always ready to lend his experience to struggling mechanics outside of his own works as well as those directly connected with the great plant under his supervision. Many of the local foundrymen refer with kindly words to some assistance or another received from the hands of the "old man" at times when help was really needed. It is given to but few men to leave behind a memory so universally revered as that left by the late Chas. A. Bauer.

We said the Warder, Bushnell & Glessner Co. operated the largest foundry in the state. We should have used the plural word foundries, as there are four operated in connection with the plant, two for malleable castings and two for gray iron. The main gray iron shop is nearly six hundred feet long and standing in one end of this building and observing the men at work one must agree that "peace hath its victories as well as war." To handle a large force of workmen and make every one count requires a general's ability, probably differing from that of the army general, but a general's just the same.

One can have no idea how far specialization has been carried in manufacturing in the United States until he visits shops of this kind. Some of our foreign readers may at times have doubted statements concerning the output of foundries here, but special de-



TYPES OF PRIDMORE MOLDING MACHINES FOR MOLDING MOWER FRAMES. THE WARDER, BUSHNELL & GLESSNER CO., SPRINGFIELD, OHIO.

vices have permitted of enormous producing capacity per capita. While the molder's work is hard no matter what branch of the trade is considered, we can not help feeling that some of our so-called jobbing molders really work harder and expend a greater amount of muscular energy in the same time in a far smaller output than does the specialty molder in producing his big pile of castings. We believe that on an average the specialist has an easier job than the general molder and that wherever machines have been introduced they have not only lowered the cost of production but made the molder's lot easier.

While it was a common impression a short time ago that nothing but plain castings could be made on molding machines, it is gradually dawning on every manufacturer than any casting can be made to advantage with a machine of some sort, provided it is made in sufficient quantities. A mold may have ever so many twists in it, may be composed of any number of parts, have as irregular a joint as can be imagined, and yet, if the castings are numerous enough, some benefits are to be gained by mechanical appliances.

There are those who think that unless a machine rams the mold no advantage is to be gained. Nothing could be more erroneous. In nearly every case the gain lays more in the facility with which the pattern may be withdrawn and the perfect state in which the mold is left than in any gain of time obtained by power ramming.

After all a mold is composed of parts, and it seems to us that if we have a machine producing each part perfectly, these may be put together with the assurance that the finished casting shall at least be equal to hand work, and in fact there is every reason to expect that it shall be better. There can be no question as to the greater uniformity in the size of machine-made castings. Any one watching a molder drawing a pattern must notice that even when doing his best there is a range of variation which leaves much to be desired. This is felt all the more in shops manufacturing articles in large quantities on interchangeable lines. We are satisfied that molding machines are but beginning to be introduced and that the end will only be reached when the cost of installation overbalances the advantages to be gained.

The frame or main casting for the Champion mower furnishes an illustration of a somewhat crooked casting being capable of being machine molded. The machine in this case is the Pridmore, the builder of which was for many years connected with the McCormick Harvesting Machine Co. of Chicago. It was while there that Mr. Pridmore was forced to develop his latent skill as a machine builder to offset the recklessness with which Chicago molders at that time used to abandon their places at McCormick's under one pretense or another. Having with comparative ease reduced the plainer jobs so that the requirement of skill was reduced to the minimum Mr. Pridmore set about changing the more complicated jobs in the same way, and many of the castings turned out on his machines to-day are silent testimonials to his ability. That the Pridmore machine has been so successful is largely due to the fact that each machine is built to order. Every job is measured and special conditions involved duly considered before a start is made. No so-called standard machine or, in other words, machines made of uniform design, such as the squeezer type, can hope to be as efficient as the machine that is built to fit the job.

The air hoist plays an important part in the Warder, Bushnell & Glessner Co.'s foundry, all the floors used for molding the heavier castings such as mower frames, mower wheels, etc., being served by these hoists. The speed and ease with which flasks, machines and molds are moved commends itself at once.

The iron is largely distributed through the medium of ladle cars and a narrow gauge track. If we remember rightly, the C. W. Hunt Company, of West New Brighton, New York City, designed this portion of the equipment.

Springfield can also boast of two piano plate foundries, the one of Wickham, Chapman & Co. being the oldest, while the O. S. Kelly Co. have just completed and moved into their new foundry, about three-fourths of which will be turned over to piano plate molding, the balance being reserved for other castings consumed in the company's own work.

There is about as much difference as could well be imagined between these two establishments and their method of working that we are going to devote a few lines to a short description of each. The foundry of Wickham, Chapman & Co. is not what would be

FOUNDRY OF
FOOS MFG. CO.
FOUNDRY OF THE
BETTENDORF
METAL-WHEEL CO.
FOUNDRY OF
SPRINGFIELD
MACHINE
TOOL CO.

called modern. The business has continued to grow until the cupola has been surrounded by additions, which make the foundry appear as if it was divided into departments. The shop is not overabundantly supplied with light and the low head room must make the atmosphere rather uncomfortable during the dog-days. At the same time the shop is no worse in these respects than a thousand others.

The molders in this shop work in pairs on the piece work plant, the company providing several laborers to assist them in rolling up the hinged flasks. The molders earn a higher sum than the jobbing molders of the same city and do not appear to be killing themselves either. Of course we don't mean to say that they have anything like a soft snap, the idea to be conveyed is that a molder would not have to look very far to strike a tougher job.

The flasks at this place are made of wood sides with cast iron bars, a construction that at the same time combines lightness with strength. As the flasks are rather large and no power hoists at hand lightness must be a desideratum. When it is remembered that the molds are shaken out a short time after pouring and that the bolts holding the bars to the side of the flask have no chance to become hot it will readily be understood that these flasks last an incredible long time. The castings, besides being molded by the piece, are cleaned by the same system, giving the company a definite output at a definite cost.

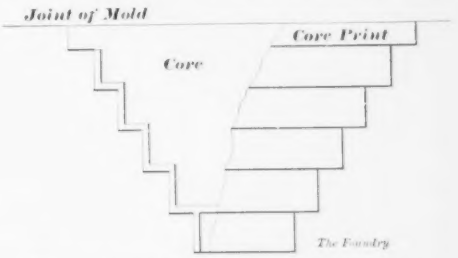
The new foundry of the O. S. Kelly Co. is built on modern lines with plenty of light and head room. The Rogers Iron Co., of Springfield, furnished the design and completed the iron work. Each piano plate floor is served by a suspended crane operated by hand power. The flasks are wholly of cast iron and if our recollection serves us right a molder and a helper work together. This firm has built specially constructed tumbling barrels for cleaning its castings, largely doing away with wire brushes and hand work.

Now, if anyone should ask us which one of these shops can turn out work at the lowest cost it would puzzle us to give an answer. We have read so much about the modern shop being the only money-maker and yet facts prove that some mighty old-fashioned establishments are far from being out of business. As the O. S. Kelly Company constructed its flasks so that some kind of a hoisting apparatus became necessary, it would seem as if a system of air or electric hoists instead of the hand power outfit they have should have been better. Of course the hand hoists they have are convenient as far as they go, yet it must be admitted that any hoisting apparatus relying on human beings for its motive power must be both relatively slow and expensive.

James Leffel & Co. are manufacturers of turbines, engines, etc., and some of the castings turned out by them are what a professional molder would term crooked.

The Springfield Machine Tool Co. is a concern that has grown in a few years from a small beginning to one of large proportions, a great share of their product being for export trade. An exhibit of their tools at the Paris Exposition will add further to their foreign business.

While in their foundry we observed a method of setting the cores in cone pulleys that appealed to us as being extremely practical. While the plan may be in common use in tool making establishments, still we feel that the average jobbing foundry has more or less trouble with this kind of castings. In all pulleys the metal should be distributed as evenly as possible, and the difficulty in producing well balanced cone pulleys lays in having the core central. We know from experience that even where a good stiff flask is provided and the core bolted to the cope as solid as possible, some slight movement is likely to occur in turning the cope over. By the method shown all of this difficulty is avoided, as the core is not



METHOD OF SETTING CORES IN CONE PULLEYS.

attached to the cope but lowered independently into the mold where the core print shown centers it in the right position.

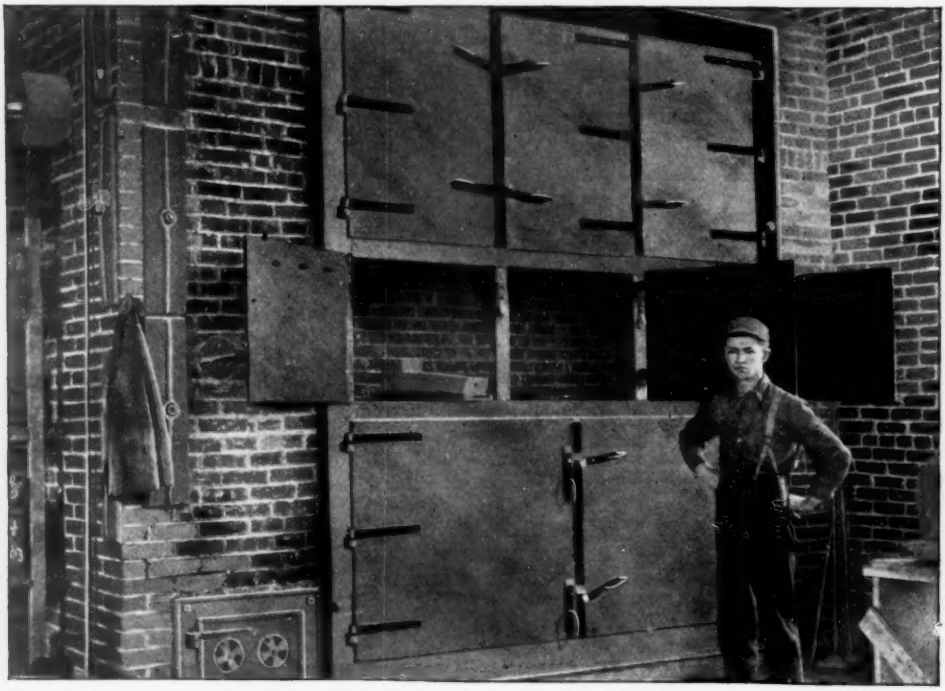
The Foos Mfg. Co. make grinding mills of various kinds and have lately built their own foundry, which has already proven too small for their needs. Their shop is traversed by a Whiting pneumatic traveling crane operated from the floor. As this company require

castings of varied hardness, they have adopted the sensible course of putting in a small cupola for special mixtures instead of trying to melt three or four different kinds of iron from one cupola, as some manufacturers are doing with more or less dissatisfaction. One particular point that forced itself upon us in this shop is the substantial manner in which their flasks are made. As many of the castings are of special shape, the flasks are made to conform to this and any weak point reinforced by an iron strap. It costs a little more money in the first place to do this, but we are satisfied it more than pays in the end.

The Springfield Foundry Company, presided over by J. G. Sadlier, turns out a great many gas engine castings, supplying a number of different manufacturers. They are now preparing to do a heavier class of work than formerly, and also increasing their facilities for turning out the engine lathe made by them. We don't know whether it is in the knowing how or in the kind of iron they use, but some of the castings used in the latter machines have a closeness of grain and high finish that we have never seen duplicated.

The Superior Drill Co. are manufacturers of agricultural machinery, and some of their castings must be very uniform in size. A couple of Pridmore molding machines are used for one of these patterns and produce a casting that is far superior to hand work.

No better illustration of the extent and thoroughness with which American manufacturers have reduced the cost of production through specialization could be afforded than a visit to the plant of the Bettendorf Metal



CORE OVEN, WITH INDEPENDENT DOORS AND SHELF ARRANGEMENT, HEATED BY NATURAL GAS. THE FOOS MFG. CO., SPRINGFIELD, OHIO.

Wheel Company, an offspring and smaller than the parent company of the same name at Davenport, Iowa. This concern, as its name implies, manufactures metal wheels, nothing but wheels. As we stood in their warehouses and looked upon hundreds of thousands of iron wheels, the greatness of this country of ours forced itself upon us more than ever before. The thought that occurred to us first of all took the form of the question: Where do all of these wheels go to? This is answered largely by quoting the number of manufacturers of agricultural

machinery, manufacturers that do business on a large scale. In the words of Henry Lamp, superintendent of the Springfield company, their existence depends upon their ability to manufacture wheels of a superior quality and at a less cost than can be done by the individual manufacturer of such machines as call for these wheels. That the Bettendorf Metal Wheel Company is able to do so is answered by the fact that they are operating their plants at Springfield and Davenport to their full capacity.

When it is further stated that this company consumes about one hundred and fifty tons of steel a day for rims and spokes, the hubs of the wheels being the only part made of cast iron, and that the Davenport plant consumes nearly twice as much of this material, one can form an idea of the activity which prevails.

Naturally from the standpoint of an iron founder one would expect to find but little in a specialty shop of this kind to appeal to his sense of originality. Who would expect that the molding of wheel hubs could be anything out of the ordinary? Yet the contrary is the case.

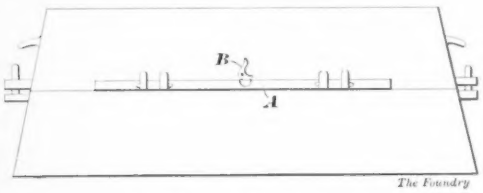
We have often contended in these columns that the manufacturer who consumed castings in sufficient quantities could make these far cheaper than he could buy them, because in the natural order of things he could specialize his product and get up a rigging for making them that the jobbing founder could not afford to do, owing to the uncertainty of the length of his contract. While the Bettendorf Metal Wheel Company have only been operating their own foundry for a short time, yet, although no figures as to the cost of production were given us, we are satisfied that their cost sheet will show a handsome balance as against purchasing their castings in the market.

That machines and appliances for aiding the molder are not in more general use is due as much to a lack of ability on the part of our foundry managers to turn the machine to their advantage as to any lack of merit in molding machines themselves. In the first part of this article we have illustrated a machine for the making of a rather crooked casting (the Champion mower frame). Of course, this is nothing but a two-parted job, but at the foundry of the Bettendorf Metal Wheel Company they have a machine for molding a three-parted one. If we remember rightly, this is also a Pridmore machine. By right we should not say a machine, be-

cause there are three of these; one molds the drag, one the cheek and another the cope.

Naturally this seems simple enough. Each machine makes one part and the three make the complete mold. That is as plain as that two and two make four. And yet we hear a good deal of talk about the machine, or mechanical appliances, being worthless except for plain jobs. When this whole thing is analyzed it will be found that whether a machine amounts to anything or not depends largely upon the man who handles it.

Natural gas is so abundant in the Springfield territory that this fuel is largely used in the foundries for all purposes. The majority of the foundries use it in their core ovens and for heating purposes. At the works of James Leffel & Co. we saw it employed in skin-drying molds. A rubber hose and a piece of gas pipe comprise the whole outfit, the flame being passed over the surface of the mold until it is dried sufficiently. One advantage possessed by natural gas as a medium for drying molds is that it does not crack a mold as a coke or charcoal fire will do, as the heat is applied more uniformly. At the Bettendorf foundry the power plant consists of a pair of gas engines as the demand for power is intermittent.



A NOVEL FLASK.

As a novelty to the majority of the readers of THE FOUNDRY, we are going to illustrate a removable flask which operates on an entirely different plan from the ordinary snap flask. It performs all the functions of the latter and is taken off the mold, which, during casting, is held by a box and shifted in the usual manner.

As will be noticed from the illustration, the flask is tapered from top to bottom, the taper being uniform and in one direction through both cope and drag. It is evident that the bottom board will keep the sand from falling out of the drag part of the flask after this is turned over, but what is just as sure is that the cope could not be removed without some special fixture to keep the sand in place. This is accomplished by the hinged flange A, which is turned inwards and held in position by the catch B while the mold is being made and until the same is closed. When this is done the catches B are released and the flask may be lifted away with ease.

These flasks are made of cast iron and constant use increases the smoothness of their sides. At the Bettendorf foundry they are used on a molding machine, though of course their utility has nothing to do with this. One thing is apparent, the ease with which the boxes can be shifted from one mold to another. The perpendicular snap flask requires extreme care in the adjustment of the boxes during shifting. If a box fits loose there is danger of the mold running out, if it fits too tightly the mold may be injured. With molds of the shape shown the boxes adjust themselves; in fact, the shifting of this kind of molds is a picnic compared to the shifting of straight or perpendicular flasks.

CAST IRON NOTES.

Devoted to Inquiries from Practical Foundrymen on the subject of Melting and using Cast Iron. Address all Inquiries to W. J. KEEP, care of The Foundry.

PHOSPHOR BRONZE.

Question: "I have a book that says in making phosphor bronze use two to four pounds of stick phosphorus to 100 pounds of metal. Have you tried mixing in a small ladle by putting the phosphorus in the end of a rod bored to hold it, and submerging it in the melted metal. Seems like part of it would burn up?"

Answer: The phosphorus can be added as you describe by placing ordinary white stick phosphorus in a hole in the end of an iron rod and stirring the metal with that end of the rod, but it will do as well to hold the stick of phosphorus in a pair of tongs and stir into the molten metal. You have not quite understood the use of the phosphorus. All copper or copper alloys are contaminated with oxide, which prevents its making a solid casting. The phosphorus unites with this oxide, and this burning makes the copper perfectly pure as the oxygen and phosphorus rise to the top in the form of a slag, leaving the copper much better than before.

It is intended that the phosphorus shall burn, and none need remain in the copper. However, by adding an excess of phosphorus a portion may be caused to alloy with the copper, causing it to be harder and more solid, and it will form a dense casting. Its

strength will be increased and its color improved. The phosphorus causes the melted metal to be more fluid and better fitted for intricate castings.

A MIXTURE OUT OF ORDER.

Question: "We are using a mixture for stove plate composed of one kind of pig, our sprues, and old stove plate scrap. Had good results till we run out of the pig and had to substitute another brand. Now, though the analysis sent was nearly the same as that of our old pig, that is, G. carbon 3.50, C. C. .30, silicon 2.50 (the new iron had si. 3.00), our shrinkage run up .010 in. to .012 in. higher and chill 1-16 in lower than formerly.

"By adding 10 per cent more pig the iron was improved but was much weaker, more shrinkage, and less chill than the old mixture. I trust you will answer in the next FOUNDRY."

Answer: This founder is a good deal mixed up. It is a dangerous practice to use only one brand of pig iron. A mixture of two or three is much better, so that a change in any one will not produce a very marked effect on the castings.

When a man who uses a very little iron receives an analysis of pig iron giving graphite, combined carbon and silicon, he ought to know that it was not necessarily descriptive of his little lot of iron. If the silicon alone had been given it might have been approximately correct, but more probably not.

Such little founders are very often imposed upon by the small iron peddlers of whom they purchase their supplies.

This founder was told that the new iron contained 3.00 per cent silicon, while the iron that he had been using contained 2.50 per cent. This would have been a better stove plate iron than the former. He says the castings had 1-16 less chill. This looked as though the silicon was higher.

He seems to consider this decrease of chill a disadvantage, and it probably was if he cast his plows from the same heat.

He says that the shrinkage increased, but does not give the shrinkage per foot, which might have been valuable information. An increase of silicon would generally decrease shrinkage and chill and never decrease chill and increase shrinkage.

The method of measuring must have been wrong. A low shrinkage stove plate iron and a deep chilling plow point iron cannot be taken from a cupola with one mixture.

The founder says the new pig iron made weaker castings than the first iron.

Evidently this man ought to know more than he does both about iron and about its appearance.

If he would measure the shrinkage of a test bar ½ in. square and 12 in. long each day and keep the shrinkage uniform by adding a little silicon iron as needed, he could make very good castings.

MELTING IRON WITH CHARCOAL.

Question: "When using charcoal with bad coke in a 28 in. cupola, say equal parts in bulk, should the charcoal be placed at the bottom or on top of the coke, or mixed with it to produce less slag and warmer iron. Is not a facing made from ground charcoal better than one from ground stone coal for medium-sized castings?"

Answer: As you have the materials and are using them, you had better find out by trial and if the difference is not enough for you to tell which is best you might as well take your choice.

Regarding facing, it is foolish for a little foundry to grind its own facing. Better purchase from one of the many manufacturers who will know what is best for your purpose. To mix with your sand, stone coal facing is what you need. Charcoal facing is only used on top of a lead facing when the pattern is to be returned to the mold, and its only use is to prevent the heavy facing sticking to the pattern. You would hardly use either lead or charcoal on medium-sized castings unless you used the lead with a brush.

Shot Iron and Hard Spots in Castings.

BY EDWARD KIRK.

There are numerous small particles of molten iron which fall from the cupola spout to the floor when tapping out, stopping up and changing ladles. Iron is spilled from ladles in the gangway by careless molders, when carrying them; small particles are frequently spilled on the top of molds when pouring, and many small particles fall from the cupola when the bottom is dropped.

This iron when collected is designated in different foundries as shot iron, gangway scrap, foundry scrap, cupola scrap, tumbling barrel scrap, etc. In describing it, we shall designate it by its more common name, shot iron, and include in it all very small scrap from a foundry, such as shot, fins, vents, shells from runners, ladle sculls, etc.

Shot iron is collected from the dump when cold by breaking it up and carefuly picking

it over to recover the iron. In this way of recovering the iron, many or all the smaller particles are left. In foundries in which tumbling barrels are used, the entire dump is generally broken up and thrown into the barrels, with castings to be cleaned, or into a tumbling barrel kept for tumbling the dump. When put in with the castings, many small particles of iron are lost by passing through the large holes in the staves, or cracks between them. When a barrel is kept for the dump the openings are generally made smaller for the escape of the dirt and cinder, and more iron is recovered.

Shot and other light scrap from the top of flasks is collected upon a shovel and thrown into the gangway or dumped into the sand heap by careless molders and recovered when riddling sand for a mold and thrown out. Shot from about the cupola spout and gangways is collected by scraping or sweeping up the floors and riddling this or putting it in the tumbling barrel with the dump. When riddled, a number two riddle is generally used, and all the small particles of iron are lost that are recovered, when the refuse is thrown into a close tumbling barrel.

A machine has been invented and is now in use in some foundries, for recovering every particle of iron from foundry refuse.

The dump and other refuse is first broken up and cleaned in the tumbling barrels and the smaller particles of iron, escaping from the barrels, are recovered by passing the refuse from under the barrels through a machine consisting of an ingenuous combination of vibrating screen and fan, for extracting all shot and other small iron from the refuse.

A barrow full of refuse will pass through the separator in three or four minutes. All the iron being deposited in a box provided for it and all other material thrown to the rear of the machine. We have seen this machine in operation and it does its work to perfection. Founders who believe in saving every particle of iron, can do so by putting in one of them.

Some founders endeavor to recover every particle of iron from foundry refuse, others only recover the larger pieces, and permit the cupola dump and also gangway cleanings to be thrown in the dump, without first recovering the small iron.

Let us see which of them is the best off in the end.

Shot iron from the dump is hardened to some extent by rapid cooling of the lump by water, and is annealed by slow cooling and softened to a considerable extent.

To prevent hardening this iron, some foundries only permit a few buckets of water to be thgown on to deaden the surface, and permit the dump to cool slowly.

Shot from the gangways is hardened to a perceptible degree by sudden cooling in the open air, and partakes of the characteristic of the iron from which it was made. That from very soft iron is soft but hardened to some degree. That from an iron inclined to run hard is white all the way through, or show a white outer edge. By noticing the character of iron in shot on the top of molds, an accurate idea of the quality of iron in the castings may be formed, especially in light castings.

To restore gangway shot, vents, etc., to their former condition, they are sometimes, after being cleaned, thrown on top of the cupola dump and permitted to anneal over night, then thrown in the tumbling barrels and recovered with the dump scrap. It is doubtful if this restores the iron to its former condition, although it is softened to a perceptible degree when the lump is of a sufficient size to retain its heat for any length of time.

This was the common practice, some years ago, in foundries making fine castings from charcoal iron, costing from forty to fifty dollars per ton.

Founders have always been troubled with hard iron to a greater or less extent, and among the numerous causes assigned for it, is that of shot iron hardening other irons when melted with it.

To prevent this iron hardening other irons, various plans have been devised for melting it; among them, the melting of shot at the end of a heat, or in a heat by itself, and run into pig to be melted with other iron in the regular heats.

A device was patented a number of years ago for melting shot, consisting of a cast iron pot or tube with a device for tightly closing the end with a cast cover to exclude the blast of the cupola. It has also been melted in tight wooden boxes, open pots, and enclosed in iron by placing it in pig molds and pouring molten iron upon it, in such a way as to inclose or imbed it in the pig.

It has been found that the quality of shot iron is not improved by melting it at the end

of a heat, or in a separate heat, and running it into pig, but is deteriorated by so doing, and does not mix with other irons as well after being run into pig as when in its original state.

This is more especially the case when the iron is melted in a separate heat, for the reason that some time, and perhaps months, are required to collect a sufficient quantity of it for a heat. During this time the iron becomes heavily coated with rust, which greatly deteriorates its quality as well as the quantity of iron in the shot before it is melted, and produces an inferior quality of iron to that obtained from new shot free from rust.

The melting of an entire heat of shot iron is a very unsatisfactory operation. The fine iron packs so close that the blast cannot penetrate it in any great volume, and is thrown back upon the blower. In case of a forced or positive blast, the belts are either thrown off or the blast finds a few openings, through which the greater part escapes, and in either case the melting is slow and many small particles of iron become imbedded in the cinder and slag around the cupola and have to be recovered from the dump.

It might be as well to say something about the recovery of iron from foundry dumps here as elsewhere, as this iron comes under the head of shot iron, as we have classified shot iron in describing it.

Founders who come into possession of foundry plants that have been run by others for a number of years, frequently find in the foundry dump a considerable quantity of iron, which may have been placed there by careless workmen, or by the old management, for unknown reasons. The new management frequently undertakes to recover the iron, under the impression that its loss was due to the extravagance or carelessness of the former management, which is not always the case.

Jesse Star, when running the Camden Iron Works, one of the largest pipe foundries in this country at the time, threw the cupola dump and gangway cleanings in the foundry dump, after recovering only the larger pieces of iron.

When a new management took charge of this works, they discovered this supposed extravagance, and a gang of men were put to work to recover the iron, many tons of which were taken from the dump, melted and run into foundry pig, for future use in the regular heats. This iron was soft iron suitable for pipe work, when consigned to the dump; but had lain in the dump for a number of years, and became oxidized or heavily coated with rust, and when melted and run into pig was very hard. The pig, when melted with other pig, would not mix with other irons, to make a soft or homogeneous casting. This was probably due to a change effected in the iron by oxidization, while in the dump.

After numerous attempts to use the iron in various ways, resulting in the loss of many castings, it was piled in the foundry yard, where it has remained for probably twenty years. A fair sample of foundry pig, the iron was only fit for weights, and was not worth half it cost to recover it; even with pig iron at a high price.

A stove foundry making plate from cold blast charcoal iron, many years ago, found the plate to run hard, when the gates and sprues were remelted with pig, and threw them with all other small scrap into the dump. An attempt was made, after it had lain there for many years, to recover this high-priced iron from the dump, but it was found, after a considerable amount had been recovered and run into pig, that it was not worth the cost of recovering it. Other instances might be cited of the recovery of dump iron, but these are probably sufficient.

The experience of numerous foundries we have met show that it does not pay to recover iron from a dump, if it has lain there any length of time, no matter how great the quantity of iron in the dump.

The device patented for melting shot in iron pots, consisted of a pot or tube with one end closed and cast in a three-part flask; that a groove and number of small lugs might be cast on the open end for holding the cover in place. The cover is cast with a number of small notches for passing the lugs, and when dropped into place in the groove in the end of the pot, and slightly turned, is securely held in place by the lugs, and may be looted with clay or other material, to exclude air from the pot and its contents.

These tubes were made to hold from 50 to 100 pounds of shot, and when filled and looted were charged into the cupola with other iron, care being taken not to break them in charging.

These tubes or pots excluded the blast from the shot until the pot melted and its

contents were heated almost to the melting poin. But it was found that the pots did not improve the quality of iron melted from the shot to a sufficient extent to justify the expense of making, filling and looting them, and their use has long since been abandoned.

When melted in wooden boxes, the boxes are generally made of one-inch hemlock or other cheap boards, securely nailed to hold the small iron together, and from fifty to one hundred pounds of shot are placed in a box and the cover nailed on. These boxes are generally charged on top of the pig, and care taken not to break them, when charging scrap or other iron. The boxes do not burn in a cupola when charged with other stock, until they settle into the melting zone, where they are consumed, leaving the shot in a compact mass to be melted. This way of melting shot iron was supposed, for a number of years, to give excellent results in melting it, but this has been proven to be a fallacy, and the boxing of shot has generally been abandoned.

The enclosing of shot iron in pigs by pouring molten iron around it, is a very difficult and unsatisfactory operation.

When shot is placed in sand molds, many small particles are lost in the sand, and the sand in a short time becomes a scrap bed. When placed in an iron pig mold, in any quantities, the molten iron when poured upon the shot, does not penetrate the mass to any extent, and the only shot that adheres to the pig, when cold, are those on the surface, and many of these drop off in handling the pig. The only way to get this iron thoroughly enclosed in a pig is to place it in molten iron in the pig mold. This is a dangerous process, as damp, cold, or rusted iron causes molten iron to explode, and it is almost impossible to keep this small iron entirely free from dampness and rust in a foundry. This way of preparing shot iron for melting is generally abandoned after a few trials.

From shot iron we may obtain when remelted three distinct grades of iron which for convenience in describing we shall classify as Nos. 1, 2 and 3 foundry pig, which are not to be confounded with foundry irons of these grades.

These three grades are made from exactly the same iron and may be cast in the same heat. But two of them are not produced by changes effected in the iron, in the cupola, nor by the size of shot or manner of cooling, but are produced by a change effected by oxidization, or rusting of the iron after it is cast.

In demonstrating the existence of these three grades of iron, numerous experiments were made in melting shot iron; to determine the cause of hard and uneven iron in castings, when a soft iron had been placed in the cupola.

In making these experiments or tests, the shot was placed in closed wooden boxes, and melted alone in a small cupola, that the results might not be changed by the mixing of iron from the shot with other iron that might have lodged in the cupola, if melted at the end of a heat of other iron.

A few boxes of new clean shot from the tumbling barrels were first melted and run into pig. The pig when broken in various places showed a small crystal of an even size throughout the fracture, and in the different fractures. The iron filed and drilled freely in the pig, but was much harder than the iron from which the shot was made, and when run into a plate a half an inch thick, which was done from the same ladle the pig was cast, was too hard to drill freely. This iron was afterwards found to be the softest iron that could be obtained from shot iron, and was designated No. 1 foundry pig.

A promiscuous lot of shot that had lain for some time and was heavily coated with rust was next boxed and melted in the same way. This produced a pig which, when broken in various places, showed a very uneven crystalization in the fracture. In some spots or places the iron was almost white, and in others showed a small open crystal. The half-inch plate cast from this iron showed an uneven fracture, like the pig, and was too hard to be drilled in any part.

In this test a spotted, uneven iron was produced in the pig, and to determine the iron that caused the hard spots, the rusted pile of shot was carefully sorted and all the very small or fine shot placed in boxes by themselves and the large shot or pieces of iron placed in other boxes, and these two grades of shot melted in separate heats.

The larger shot, among which were pieces weighing from one ounce to four or five pounds, when melted and run into pig showed a close mottled iron with an even crystal throughout the fracture.

The pig was too hard to drill freely, and the half-inch plate cast from this iron could

not be touched with the drill; this iron was designated No. 2 foundry pig.

The small shot was next melted and poured into pig, which when broken showed a white iron in various parts of the pig, with no crystalization and very hard and easily broken. This was designated No. 3 foundry pig.

The tests were made in a foundry making light castings, and using soft iron, and all the shot was made from this grade of iron. The per cent of iron lost in melting the different grades of shot described, varied from 10 to 50 per cent. The lightest loss was in the new shot, and the heaviest in the very small rusted shot.

These tests showed that rusted shot produced a hard iron, and the degree of hardness varied with the extent to which the shot was rusted. The small particles, which were almost entirely destroyed with rust, produced a harder iron than the larger shot, in which a considerable body of iron had not been affected by the rust. It also showed that the iron from heavily rusted shot would not unite with iron from larger shot to produce a homogeneous iron in a pig.

That iron from rusted shot is not softened by melting it with soft iron was shown later on in melting small rusted shot with a very soft No. 1 iron. In this test, an equal weight of shot and pig were charged and run into pig and also into light castings. The pig when broken showed a very uneven crystalization in the fracture. In some parts it was very open and soft, in others very close and hard, showing the two irons would not unite in a heavy casting to produce an even iron. In the thin castings, in which the iron had been suddenly cooled, the iron from the shot was white and in some places had separated from the soft iron and sandwiched in between two layers of soft iron. In thicker castings it had separated and formed in small nodules.

These same phenomena have also been observed in other foundries when melting shot with other irons, and also when melting pig made from shot with other irons, showing conclusively that one of the causes of hard spots in castings is rusted shot iron, and that hard spots are not prevented by melting shot at the end of a heat and running it into pig before melting with other iron.

Many careless molders never remove scrap from the top of molds before shaking out, and seldom throw out riddlings, until the sand heap becomes so filled with small scrap that it is no longer fit for molding. Scrap from top of molds and also riddlings are thrown in a corner or any out of the way place, where they are permitted to remain for months. Gangways and also molding floors are frequently permitted to fill up with scrap and sand and only cleared and scrap recovered once in six months or a year. This scrap is heavily coated with rust and many of the small pieces are almost entirely destroyed with it.

To recover this iron, it is necessary to riddle all the refuse, or pass it through a separator, and in some cases to dry it before so treating. In few, if any, cases is the iron recovered of sufficient value to pay the wages of men for time employed in recovering it.

It is more economical to throw all this refuse in the dump, only recovering the larger pieces of iron as they may chance to be presented to view. When gangways are cleaned every day, a better grade of shot is recovered, but in this shot badly rusted scrap from the sand heap riddlings are found. These, when melted with new shot, produce hard spots; their hardening tendency can be removed to some extent, but not fully, by tumbling to remove the rust, but it will probably be found more profitable when only fine work is made, to provide a place for sand heap riddlings and consign them to the dump.

I have not had a sufficient experience in melting shot iron with a ferro silicon iron, claimed to produce a soft casting with 90 per cent of scrap, to accurately indicate results. This iron may restore to shot the properties removed by rusting, and enable the founder to profitably utilize all this class of iron, without risk of impairing the quality of his casting by hard spots.

In trying this, the shot and ferro silicon iron should be drawn from the cupola together into a large ladle to give the two grades of iron an opportunity to mix, and the iron should be well stirred before pouring. New shot from the dump and gangways mix with other iron when melted with it, and probably the best way to melt them is to distribute them through the heat, placing a small amount in the cupola with each charge of iron and in this way melting in each heat, all the shot from the former heat. In describing this iron, to which the term oxidized iron is also applied, the term rusted has been

used, for the reason that it is the term most commonly used in foundries, hence more readily understood by those most interested it, foundry irons. And, also because the term oxidized is also applied to burned iron, and is therefore misleading.

Rhode Island Graphite Mines.

BY R. H. PALMER.

While engaged in digging a well at Valley Falls, R. I., about the year 1848, Samuel Chase discovered a pocket of coal a short distance from the Blackstone river. With visions of wealth before them, Boston capitalists became interested and formed a stock company under the name of the Blackstone Mining Co., which leased twenty acres of land from the Valley Falls Mills Co. for a term of ninety-nine years. The pocket of coal first discovered gave promise of great richness, and it was thought that a better coal would be found at a depth of four or five hundred feet. A shaft was sunk to a depth of seven hundred feet without obtaining a coal that was saleable, as the product was not suitable for heating purposes excepting under certain conditions which none cared to investigate.

About the time the stockholders became tired of paying assessments to keep the mine in operation someone suggested that since the coal was valueless as a fuel, it might possibly be worth something as a foundry facing or blacking. Mr. Edmund Clark acted on this suggestion and had some of the coal dried, pulverized and tried on some molds in the Sumner-Fifield foundry at Pawtucket in 1854, and the results obtained in the way of smooth castings were far ahead of anything accomplished with other materials at that time. After this the mine passed into the possession of Mr. Clark, who erected a large building and equipped it with the best appliances then existing for the production of facing.

A geologist of those days said in referring to the peculiarities of this product that it was neither coal nor plumbago, but resembled a cross between the two, the formation thereof having been caused by intense heat.

The Rhode Island graphite, when applied to the mold through a dust-bag, adheres thereto and will not wash away before the flow of the iron. Where a mold requires to be slicked or where the pattern must be returned for printing, as in stove shops, it becomes necessary to cover the graphite with a coating of charcoal to prevent sticking. When used as a blacking on dry sand and loam work, the Rhode Island graphite will peel the heaviest castings, leaving them with a slightly darker color than the imported Ceylon facings.

The product of the Clark mine has always been ground into facings, none of the Rhode Island mines producing any coal that is worth much as a fuel. The mine is now worked at a depth of 350 feet.

The Rhode Island Graphite Co. also have a mine producing a very good quality of graphite which is sold to others, for use in manufacturing facings, as the company only grinds graphite for use in the making of paints.

Shouldn't Wonder.

Mechanics are at work building ventilating cupolas on the foundry at the Separator Works. This was found necessary to allow the smoke and heat to escape from the building. This will add much to the comfort of the men when engaged in running a heat.—Exchange.

A city contractor having occasion to use a good many castings for man-holes, catch-basins, etc., concluded to buy an old foundry and start it up to make his own castings. The water power for driving the place was the lower one of a number on the same stream. A foundry foreman who knew all about the conditions, was questioned whether he would have power enough. "Oh, yes!" he said, he was sure he would, *as none of the people above him were using the power.* After getting started he was asked if he had power enough. "Oh, yes!" he said, "we have power enough, but there isn't enough water."—American Machinist.

A short time ago the Portage Lake Foundry and Machine Co. had their plant near Hancock, Mich., destroyed by fire and with a nose for news the local reporter was upon the scene early. After telling the readers of his paper that the flames started in the cupola he reports an interview with Mr. S. E. Cleaves, manager of the company, in which occurs the following:

"Mr. Cleaves thinks that the fire must have been ignited by the escaping sparks or cinders from the gates in the cupola, through which the iron is fed into the furnace."

This is the brightest speck of information that has come to us in many a day.

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We want to obtain examples of current foundry practice. Photographs, drawings and descriptive matter, showing just what is being accomplished in the foundries of to-day, will be cheerfully paid for.

We can not furnish a continuous set of back numbers beyond the current year.

Entered at the Post Office at Detroit, Mich., as second-class matter.

Trade Outlook.

While a small gain now and then in the visible supply of pig iron gives consumers added encouragement in the belief that present prices must recede to some extent, there has been no transactions reported which can in the least be construed as indicating a weakness on the part of furnaces.

The only cloud to mar the smooth sailing of the trade is the extensive labor disturbances which at the present writing appear to be gaining in force and intensity. It is true the foundries are not directly involved, but the foundry trade is very sensitive to interference with other industries, and may be one of the first to show a weakening effect therefrom.

The specialty shops continue to be taxed to their utmost, and this applies especially to manufacturers of agricultural implements of all kinds. To partly compensate for a loss in the exportation of pig iron there is an increasing demand for finished products, so that after all more labor is required to be employed.

Legal Intelligence.

We have no desire to be in contempt in the eyes of the law, but if the members of the Massachusetts Supreme Court based their rulings on the evidence in the shape it is herewith reproduced from the Boston Herald, we can readily see how almost any kind of a verdict could be rendered:

"The full bench of the Supreme Court yesterday afternoon overruled the defendants' exceptions in the case of Michael McCabe vs. Arthur E. Shields et al. of Mansfield, and the plaintiff retains a verdict of $2,425 for the loss of an eye.

"The action was based upon the negligence of the defendants' acting superintendent in their foundry at Mansfield, where the plaintiff worked as a molder. The negligence consisted in the careless manner in which the acting superintendent punched a riser into a mold and directed the plaintiff to use it in that condition. While working with the mold, molten metal flew from it into the plaintiff's eye.

"The evidence tended to show that the riser had probably been punched with a rusty instrument, which caused the rust to adhere to the sand in the mold, and when it came in contact with the molten metal, to cause an explosion. The court holds that the case was properly submitted to the jury, and that there was no error in the trial judge's refusal to direct a verdict for the defendants."

Design and Equipment of Foundries.

BY R. P. CUNNINGHAM.

I am pleased to note that the matter of designing a foundry so that work can be turned out quickly and cheaply is of late receiving more attention than it has for a number of years. It has heretofore been the custom to have the machine shop, blacksmith shop, pattern shop, draughting room and office fitted up with modern tools and labor-saving appliances so as to enable them to turn their work out cheaply and with dispatch. Everything that will make the men more comfortable is carefully gone over. They have the best of light and everything to work with. If a light of glass should be broken, it must be replaced at once. The men must not stand in the draught.

But, how is it with the foundry? Any

old thing is good enough. The idea of making the men more comfortable is not thought of; it is nothing unusual to have the windows broken all winter, and not one in fifty have any way of heating except by building fires in an old cylinder or an old iron flask, and the gases and smoke come into the shop; it is a common occurrence to have the doors opened from twenty minutes to an hour with the thermometer down to zero to bring in or carry out a large flask. Yet, this is considered good enough for the foundry.

Those that can, let them look back twenty-five years and tell me what has been done to improve the condition of the molder. Very little, compared with other branches of manufacturing. But I am convinced that in the next few years we will see foundries built and equipped so that the cost of castings will be reduced, and that the firm that does not fall in line must not expect to be able to compete with its more enterprising neighbor.

When a company or a corporation decides to build a new foundry, how many times is a practical foundryman consulted? Not often, I assure you. In most cases the proprietor or manager has a friend who is an architect and he is told to draw plans for a new foundry. In due time the plans arrive, the contract is let and the building is put up, but a foundryman is not consulted; his advice is not considered necessary, and the result is that they have a building that could be used for a storehouse, but entirely unfit for a foundry; a low, dark, forbidden-looking building, with no heat, poor light, no ventilation, the windows small and low, and the center of the shop the darkest. In drawing the plans the saving of labor was not thought of. Everything had to come in and go out the same door. This is only a fair illustration of what the practical foundryman has had to contend with, and until the last few years he could see no chance for an improvement.

Several new foundries have been lately erected and every little detail has been thought of and carefully considered: wash rooms, bath-rooms, and private lockers, and there is no excuse for the men to leave the shop and not look as clean as any other class of mechanics. I know of a firm that has a wash-room for the machine shop, but does not allow the molders to use it.

In designing a new foundry there are several points to be considered. First, the location, which should be near the water or a railroad, so that everything that comes into the yard could be put in its proper place without extra handling.

The next to think of is the kind of work to be done, and also the quantity has much to do with it, as a shop turning out fifty tons of castings a day would require different equipment from one turning out only ten tons. Then, again, the kind of work will have to be taken into consideration, whether heavy or light, if it is all made in green sand, some in dry sand, and some in loam, or if you intend to use a number of molding machines. You should consider all these points in equipping your shop. You would not think of attempting to build engines in a shop fitted up expressly to do small work.

If you are going to do much loam work, it should be done either in a separate building or in one end of the shop, where the casting pits could be arranged so as to take up as little room as possible. There should also be near this place a core oven, where the cores on this work could be made, to save extra handling.

If you are going to do dry sand work in any quantity, you should have it so arranged that when a molder finishes his mold he will have nothing more to do with it. Laborers should take it and put it in the oven and in the morning another gang will take it out, core it and get it ready for casting. By doing work in this way more time may be saved, as a few men can core and close the molds for a large number of molders.

The core room: If you are using a large amount of cores, you cannot overlook this department. Here is where a large saving can be made. Poor cores cause poor work, and often the cores cost more than the molding. If your work is heavy, you should have good carriages made to run easily, and have an overhead track, with an air hoist to put the work on the carriage. In this way two men can handle the largest cores, where otherwise it might require five or six men to do the work. The fire-box should be arranged so that the fire will not come in contact with the cores. If your work is light and you are using a large amount of small cores, by all means have a Millet Oven, that takes so little room, and your oven is always

hot and the cores dry in one-half the time than they would in an ordinary oven. When you draw out one of the shelves on these ovens, there is a door that closes from the inner side, keeping all of the heat in the oven.

The core room should open out of the foundry and you should have small cars built with springs to handle the large cores.

The matter of taking the castings out of the foundry is the next important point, about which I wish to speak. The cleaning room should be located at one end or at the side of the foundry, near the shipping department, so that when the castings are cleaned they pass on to the shippers. The flask yard and the sand houses should be so located as to have separate tracks, so as to avoid as much as possible the usage of the same track for everything.

Until recently the writer had charge of one of the largest foundries in the country. Their melt averaged from sixty to seventy-five tons a day. They used the same track to bring in their cores, flasks, sand, etc., that they did to take out their castings, scrap and waste. It was a common occurrence to have two cars meet on the same track, and two mules and a half dozen men stand around until someone decided who had the right of way.

The kind of cranes to adopt is something you must not overlook. There are as many different opinions as there are makes of cranes. Some will have nothing but an overhead traveler, while others will tell you that several jib cranes through the center of the shop will be more economical, as there will be less waiting than there would be with only one traveler. Here again, the kind of work that you are going to do must be thought of, and all your plans must be to get this particular kind of work out quickly and cheaply. If your work is heavy, then your overhead traveler is all right. If your work is medium, but requires the use of a crane to roll over the boxes, take off the copes and set the cores, an overhead crane is not what you want, unless your shop is large and high so that you could have a row of post cranes on the side of the walls to handle the small work, setting the cores, etc. It is my opinion that unless you have two travelers, that you are far better off with a number of jib cranes. In this way several could use a crane at the same time and you would have less delay than to depend on one or even two travelers. For a jib crane, The Ridgeway Steam Hydraulic Crane is by far the best post jib crane in the market, it is so easy to handle and less liable to get out of order; besides, each one is driven independently, so that if one is stopped, the rest are in working condition.

The next is the kind of hoist to use on your molding machines. Either a jib hoist or an overhead trolley fitted with ball-bearings so they will work easily and arranged the best.

The next point is how to get the metal to the machine. This can be done by an overhead track passing through brackets on the posts. By this arrangement two men can take a ton of iron anywhere in the shop. The track can be used not only to take the iron to the machines, side floors and benches, but also can take the small and medium castings from the shop.

The kind of molding machine to adopt: There are several—The Pridmore, The Tabor, The Adams, The Reynolds and several others of less importance. It will make very little difference which you decide you will use. No machine can be a success unless it is properly handled. It is the man that makes the record, not the machine. I have noticed that all the machine men refer to some shop where their machines are worked to their utmost and point out what their machines can do. But they neglect to give the credit to where it belongs, the man in charge, who has worked these machines to their fullest capacity.

The cupola room and its equipment should have careful consideration. The selection of the cupola: Any modern make is good enough, only have it large enough, fully one-quarter more than what you actually need, and above all, have a blower that will give you all the blast you want without having to force it. My idea of a cupola room is to build a separate room and to have only the spouts come into the foundry. This prevents the cold from coming into the foundry, as the doors would have to be open more or less during the day.

There should be a track from the elevator to the iron pile, and have several light cars which will hold one charge of iron, which can be weighed and set up on the stage, and

an empty one return. By this arrangement you save extra handling, as the cupola can be charged from the car.

And last, but not least, have suitable washroom. Have a number of bath rooms and private lockers, so that a man can come to work and return home and not be ashamed to be seen, as I have known cases where a man expected visitors at his home, come in quietly the back way, and change his clothes before being seen.

I suppose when this is read the reader will say it is all very well, but what firm can afford these luxuries? I admit there are some that cannot, but there are many that can, and to those I will say, why not fix up your foundry so you would be at least willing to have your horse stay there.

The ball has been started and it is going to be kept rolling until the foundry is put on a level with the other mechanical departments.

There is no branch that requires the skill and judgment that molding does. Their work is an uncertainty. One does not know the result until the work is finished. With the machinist and blacksmith it is different; the work is before their eyes, they can easily detect the slightest variation and correct it at once. If the machinist spoils a casting, there is always an excuse, but when the molder loses one, it is called poor judgment and carelessness. The foreman is told he should see such things should not occur; he should go around the shop and see that the clamps are all tight on the mold and the cores all securely fastened before the molds are cast. If he would only do this there would be no bad work.

Not by a Long Shot.

BY DROP OUTS.

Sakes alive! The February number of THE FOUNDRY came near knocking me out. I like THE FOUNDRY; it is a good paper, that seldom makes mistakes, but if its editor gives us many more bitter pills to swallow I am going to refuse to recognize him when we meet.

Here he comes out in a broadside in February and tells us under the head of "Where the Foundries Are Located" that the little, old-fashioned shop is doomed.

When I read that awful sentence my head dropped, and I gasped, but on a second thought I resolved to live to tell him what I thought. After due consideration, I concluded to be mild in my language, for he weighs more than I do. Then, they say that he will fight, and I am a very poor runner.

Considering all of the above, I will merely say that he is mistaken when he says that we are doomed to extinction, for we are here to stay. That is, such of us as possess the proper amount of energy and are practical men. I would never advise a man without the above qualities to try to run a jobbing shop, unless he has plenty of money to pay his way until he learns. Someone has said, "Experience is a free school that costs nothing to enter but the incidental expenses are tremendous." This is doubly so in a jobbing shop.

The writer was born and raised in a jobbing shop, and has seen this same shop grow from a blacksmith forge to a decent little shop, containing six lathes, two drill presses, two planers, a pipe machine, emery grinders and numerous other small machine tools, besides two cupolas, brass furnaces and general appliances required in the foundry end, and all this has been done in competition with larger shops located at different points, and the only advantage we have had over the big shop is in the matter of freight charges.

In order to show you just what can be done, I will give you a sketch of the shop since I took charge of it, and I think that if the matter were investigated it would be found that many others have prospered even more than I have.

In 1891 the writer was just 21 years of age, and was a fairly good machinist. It was then that my father departed this life and left your humble servant one 16-inch lathe, a drill press and sundry small tools, such as hammers and chisels—also a family of four to support, the only boy being but 13 years of age. My father had been in hard luck for years before his death, and as a result, he was about $2,500 in debt when he left us.

After talking the matter over, the writer and his little brother concluded to continue the business, providing the creditors were willing, which I am glad to say they were. We did no casting at the time, as neither of us knew anything about molding, and we continued our father's practice of getting

our castings from a city about one hundred miles distant.

After a while we concluded that we would meet with more success if we made our own castings, as we found that our customers preferred to get their work done in the city rather than let us get the castings and machine them.

Here is where the worst part of our fight came in. Neither of us knew anything about molding or cupolas, and we were unable to hire a molder, as we were deep in debt and had no funds with which to pay him for his services. But we had one commodity that was better than money, viz., perseverance, or determination, and after considerable thought we decided to invest $5.00—a large sum to us in those days—in West's American Foundry Practice and the Molder's Text Book.

After procuring the books we studied them carefully, and after building our cupola according to a plan set forth in one of the books we got our sand from the river bank and went to experimenting. To-day I am forced to smile when I think of the times we had with bunged-up cupolas and lost castings.

West is a No. 1 man, and a good, plain writer, but neither he nor anyone else can teach a man to mold unless that man will get down and use good old horse sense and think for himself. But I consider the $5.00 spent in his books the best investment I ever made, and if I ever have the good luck to meet West I am going to tell him so.

The above is the correct history of one small shop, and while it is almost beyond belief that a person could succeed under such circumstances, it is nevertheless true that we not only succeeded but have increased our capacity as stated in the first part of this letter; besides, we are out of debt and have a bank account. We own our own plant and several thousand dollars' worth of other real estate.

Still, we are told that the little shop must perish. I say No. Such of us as are practical men, with a fair allowance of business sense and energy are here to stay, but, as the editor says, there are many who do not possess these qualities and I agree that they must fail.

Go into a large shop and calculate the expense that they are under for superintendents, master mechanics, foremen, draughtsmen, bookkeepers, and others necessary to run a large shop. Figure out what these men secure per day. Then ask what the day's business amounts to after deducting the cost of material, fuel and workmen's wages; see what percentage of the net profit is eaten up by the salaries paid the heads of different departments, and you will find that it will be a fair profit for the owner of a little shop, for here the proprietor fills all these offices.

Again, if a little shop is blessed with prosperity and is compelled to put in extra men, these same men will turn out more work in a day than they would if working in a large shop.

It may be argued that the facilities at hand in a large shop will outclass those in a small one. This is very true; but, while they have the facilities to handle work more economically, they also have more expense in the salaries paid to their managers, and when the freight is added to the price of work from the city to the small town, it will be found that the little shop is still "in it."

Feeding, or the Compressing of Metals.

BY WM. ROXBURGH.

I feel that to reply to Mr. Edward B. Gilmour, who is now my fourth critic, and whose criticism appears in the January number, I may unguardedly repeat myself. Some if not all of those critics have more or less imported personalities, which people interested in this question could have done very well without, and I am sorry to say that Mr. G. is no exception to his predecessors is as much as he says that he is "inclined to doubt my statement with regard to anvil blocks."

I think if Mr. G. had taken more time to read or study the paragraph wherein I refer to "feeding and compressing of a ten-ton anvil block," he would have interpreted it in a different light. I never spoke of a casting of ten tons weight; what I did say was this: The last one that came under my observation, and which was much heavier, was cast in open sand, and immediately afterwards it was covered with a carbonaceous compound; this gave more superior results than could be had from feeding with a rod, less the appearance to the eye common to all open

sand castings. The casting in question weighed forty tons, and is at work within a radius of ten miles from where I am writing. Had Mr. Gilmour in his day given the habits of metal the study it deserves from practical molders, he would have seen the utility and practicability of such a process.

Further, is this not the everyday practice of our steel ingot shops, which have been so successful in keeping the top ends fluid longer, and as a consequence minimize to a very appreciable extent the spongy end of the ingot castings?

The question of open sand castings takes me back to a period of more than a decade, while experimenting with one of the finer

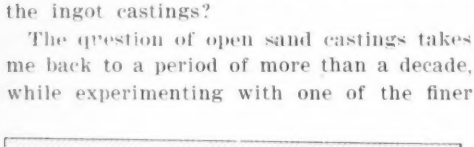


Fig. 1

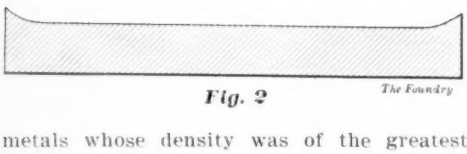


Fig. 2

metals whose density was of the greatest importance, and no expense was spared to attain this end. Various sizes of pouring gates and risers were tried, so that every assistance would be given and automatic feeding attained. This, of course, was all to improve the metal's density and for a contrast it was resolved to cast one in open sand; the result with regard to the density on the polished face I do not give, this having nothing to do with the question at issue. Figs. 1 and 2 will give an object lesson of the value and assistance there is in solidifying any metal that is cast in open sand, and covered with a carbonaceous compound. Fig. 1 being cast, was covered in the usual way by sifting a little dry sand over the top of it, which resulted in its exposed surface rapidly cooling, while underneath it was comparatively fluid, and as this part had still to solidify, and it being an extraordinary shrinking metal, it parted from its roof and created a vacuum or drawn hole—shown in Fig. 1—thus rendering it scrap. In Fig. 2 the modus opperanda in treating the job was in every respect the same, with but one exception, viz., in that it was covered up with a carbonaceous material, previously referred to. The result will be obvious; the carbon retarding the setting of the top metal, and being comparatively a thin casting, it would be difficult to say which of the sides solidified first. But I must stop short here, and return to one or more items of Mr. G.'s criticism.

The author's reference to the good and old way and his simile of the saddle wherein the man who put the saddle upon the horse because he saw another man put it on, looks as if he were that man, as he is only following to a nearness the steps of my former critics. This being so, I do not grudge him the luxury of that sweet part of his own composition wherein he states "it is better to think and be wrong than not to think at all."

His reference to what may be his alarm at the high percentage of vegetable matter that he twits me about on holding sand, looks like one who is only a spasmodic reader of THE FOUNDRY, and if he wishes to know more on this matter I beg to refer him to the back numbers of May and July of last year, and specially to page 236, and the rest pertaining to sands, by W. R.

And just a word from what he quotes from Spreston, who says that Babbitt uses old fire-bricks by grinding them to powder, with fire-clay as a binding material. This in the foundry as a molding sand, the mortar for repairing or building anew the cupola will always be at hand. Its refractoriness no one need doubt, and it was well for "Babbitt," or those engaged in his process, that he brought his molds to a red heat before attempting to cast, otherwise the consequence would have been serious.

The casual observer must wonder what sort of a plumbago or blacking "Babbitt" used on his molds, which were thus brought to a red heat before casting, as I have never seen or heard of a plumbago capable of producing a skin on a casting under such conditions. Therefore I should be exceedingly pleased, if such has come under the notice of any of the readers of THE FOUNDRY, including Mr. Gilmour, if they would through its columns relate their experience of this phenomenon.

I regret that your space forbids me entering into the first paragraph of his article, and especially with the views he has of compression through the expansion of cores,

wherein he states with emphasis that a casting is solidified to a greater extent at the bottom than it is at the top through the expansion of its cores. He would do well to give this subject more study.

Joints.

BY ELI H. PEARCE.

A good lift depends greatly on a good joint, still, oftentimes we see men at work that seem to pay little or no attention to the joints of their molds, but on comparing their castings with those of a more careful man we will note a decided difference in favor of the well-made joint.

To make a nice, neat joint requires but little more time than to make a sloppy one, and it seems to me that any molder with a desire to turn out good work should be willing to use the little necessary care to make a good joint; still, such is not always the case, though I am unable to say whether this is through ignorance or neglect.

In roll-over work, after the drag is rolled over and the follow board removed, the pattern if light should be well tucked with the hand, then some sand should be riddled over the joint and this also tucked in. Any surplus sand should be scraped off with the trowel or a straight edge and sand sifted over the surface to a depth of one-eighth of an inch; this latter sand should be sleeked down firm and hard.

If the casting be heavy it is best to lightly ram the joint after the flask is rolled over, as in this way it is quicker to make a firm joint; but after ramming it will be found necessary to hand tuck the surface also. An irregular joint requires more care and attention than a plain joint, both in securing a good lift and securing a casting without a fin. The old saying, better a fin than a crush, is very true, but why not do without both. It is generally possible to do so in green sand work, and a careful man will do it.

Fig. 1 shows a cross sectional view of a window sill, of which we made quite a lot, but it does not show a good joint, inasmuch as the small body of sand at A will seldom lift out well and will require more or less patching up, and while not advocating a fin, when patching up it is best to allow for one. Even if it does lift out, the parting sand will generally cause a small fin.

Fig. 2 shows another style joint, that will lift out well, but it is also liable to have a fin owing to the joint being at B.

Fig. 3 shows a joint that will lift well and leave no fin. Notice how the joint is made, continuing the slope of the pattern down below the point C, causing the surplus parting sand to roll down the joint to the point D, where it is away from the pattern, and will cause no fin.

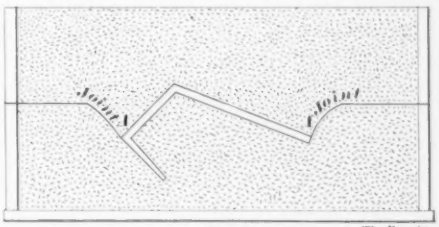


Fig. 1 The Foundry

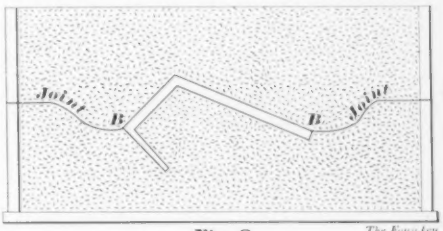


Fig. 2 The Foundry

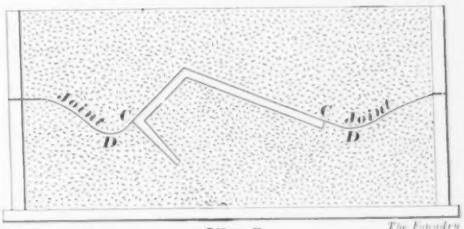


Fig. 3 The Foundry

By making the joint as shown, even if the mold be poured a little too fast the fin will be such a small affair that it will easily chip off, while with the plans shown in Figs. 1 and 2 if the mold is poured a little fast the fin will require considerable time to chip off.

In making a lift of this kind many shops will use soldiers or gaggers between the bars, and while realizing that they are the molder's friend, I do not like the use of either where they can be avoided.

Of course, on some jobs where only a few

castings are to be made it is economy to use one or the other, but as both have their disadvantages, it is best to avoid them if possible.

Where many castings are to be made it will pay to make the bars of such a shape that they will stand about an inch from the pattern and joint. This will require a little more time in making the bars, but it is more than balanced by the time saved in setting gaggers and soldiers. It also makes it necessary to put in new bars before the flask can be used on flat work, but I do not consider that the latter cost should be charged up against the plan, as the bars would probably be so burned as to require new ones anyhow when the job is completed. But even if it is not desired to put in new ones, they can be made to do good work by chopping off that part of the bar below the joint and driving nails in that part that was cut out to accommodate a pattern reaching below the level of joint.

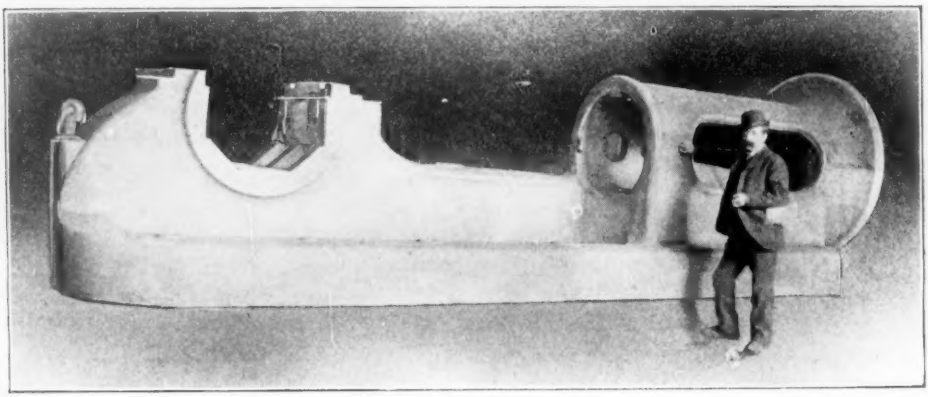
This casting is twenty-one feet long, weighs 55,000 pounds and is one of a series of twenty which have been cast successfully by the Pennsylvania Iron Works Company of Philadelphia. We are indebted for the photograph and description thereof to Wm. Hanson, superintendent of the foundry department.

Yellow Metal Castings.

BY P. LONGMUIR.

Yellow metal castings are usually required to be of good color, smooth skin and altogether to have a pleasing effect on the eye. Many foundries make a specialty of these castings and it is in such establishments that the best results are to be seen.

To produce the skin and color the metal must in the first place be of the right composition. About the best is copper 70 per cent, zinc 30 per cent. Lead must not be used in this class of work as usually the castings have to be dipped, and if lead be



BED PLATE, MADE BY THE PENNSYLVANIA IRON WORKS CO., PHILADELPHIA.

A Philadelphia Casting.

We show on this page an illustration of a bed plate for the low-pressure side of a cross compound engine, cylinders 30x52x48 inches. This casting was molded in green sand and skin dried. It was bedded in the floor with buckstays running transversely and bottom plates longitudinally, to prevent straining, and standards vertically to support the cope. No anchors were used except to support the inner end of guide barrel core, the remainder of the cores being fastened to the iron cope, which when closed is held in place with bolts through ends of buckstays and similar ones across the cope.

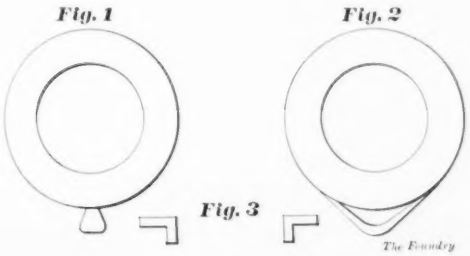
present, it will show black marks and patches on the otherwise bright casting.

The patterns should be well finished, and the facing sand used on such work must be of a fine texture, capable of taking and retaining sharp, clear impressions. It should be fairly free from clayey matter and passed through a fine sieve, firmly rammed, not hard, and well vented, as yellow brass, like other metals, is liable to scab the mold if improperly made.

A facing of flour, peasemeal or whitening in ordinary practice gives good results. Plumbago, terra flake and similar facings are not so suitable for this alloy as they are

for copper, tin, and zinc alloys. Those materials are liable to wash before the metal, and as a result, give dirty castings.

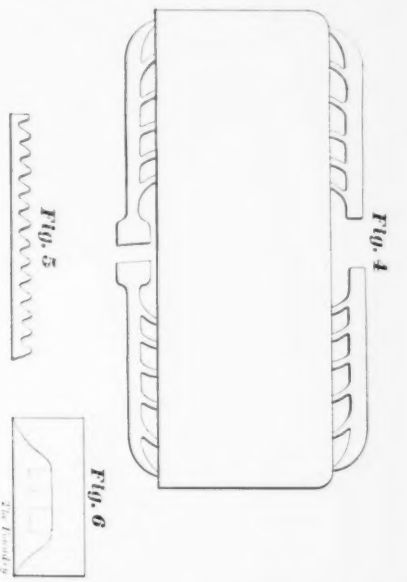
For fine work, invert the box, and fix below it a smoking pine knot; or, better still, on a red-hot coke drop a piece of resin, and allow the smoke to play on the mold. Sheets of brown paper soaked in a bath of molten resin and afterwards fixed under the inverted box give castings of good skin and color.



For castings of any considerable weight it is far better to skin-dry the molds. By so doing the tendency to scab or cut is greatly lessened, and the scrap pile not unduly increased. This is best accomplished by spraying the mold with naptha or gasoline, and afterwards firing it. Gas blow-pipes are useful; and in many foundries the old style red-hot plates are still in use for this purpose.

The gates of a yellow-metal casting should be cut with judgment, and one rule that will stand good in all cases is never to let the runner impinge directly on a core, especially so if this be a green-sand one. A further point to remember is that in most cases all the feeding has to be done from and by this gate. A gate as shown in Fig. 1 will more than likely scab or cut the green-sand core unless the latter be carefully made. This, when chipped off the casting, will leave an ugly blemish. With the gate shown in Fig. 2 the metal does not strike directly on to the core, and the chances are in favor of a much cleaner casting. Fig. 3 shows a section of the casting. This type of gate is in use for ship side-lights and similar work, and is known as a "side-light gate."

Flat plates, such as step and tread plates, do not offer much difficulty in molding; but to decide on the best form of gate is often somewhat of a puzzle. This gate must be so cut as to fill the mold quickly, and yet not be heavy enough to pull or warp the casting. Diamond pattern tread plates, if of a rectangular shape and not too long, are best gated from one end, the gate end of the box being higher, or the box "on a brae." For yellow metal, the plan of running a plate from two or more places, with two or more pots, the writer does not consider a good one, and when possible would advise its avoidance. Fig. 4 shows a tread plate 4′ 0″ x 2′ 0″, thickness of diamond 5-16″, that of groove ⅛″. The plan of gating is shown—the gates are not connected for reasons affecting contraction. Fig. 5 shows a section of such a plate. These plates are generally cast face up—that is, with the diamonds in the top part. By so doing the metal has a level bed to travel over, and the chances of getting a fully-run casting are much greater. The one head, Fig. 6, supplies the two gates, and the sprues are so cut as to get the full benefit of the rush of metal. In this class of work the metal should have no right angles to turn in order to enter the mold—the reason for this is obvious. Another point that will bear repetition is that the area of the sprues should not exceed that of the gates. How often do we see in foundry work gates of 1¾″ area having to supply sprues of 3″, and even more, in area. The flow-gates seen in



the sketch are not carried through the top part; they are only there to balance or neutralize the warping tendency of the gates. Without this provision the plates might

come out warped, or in extreme cases be completely severed through the center.

The plan of head box has been shown. Into this the metal, which must be hot, is quickly emptied. To do this in such a manner as to run the casting and yet not make over much scrap requires not a little skill. But in the casting of large and thin brass plates this is the whole kernel of the matter, and the caster who can run such plates in a satisfactory manner is somewhat at a premium.

With regard to warping, splitting and cracking of yellow-metal castings, the remedy, after seeing that the gates are not too heavy, is to equalize the "pull" on each side of the casting. For instance, in the casting of long plates and rods, there need be little fear of the casting coming out cracked or broken if flow-gates are cut in a similar manner and of about the same area as the runner-gates.

The necessity for hot metal has been referred to earlier. For thin work this is a real necessity; and it is a good plan, when the metal will not come hot, to drop in a gate of gun-metal or a little tin; this increases the fluidity of the metal. As before mentioned, lead should not be used for dipped work. For common work a small percentage of lead is, to a certain extent, beneficial, and the metal is much easier to tool for this addition. It has also a further advantage in the fact that it lessens the cost of production.

To go into the compositions of the various yellow metals would take up an article on that subject alone; but it may be stated that the percentage of lead added to these metals in most cases varies according to the conscience of the maker, and his ability to hide that lead in the castings he makes.

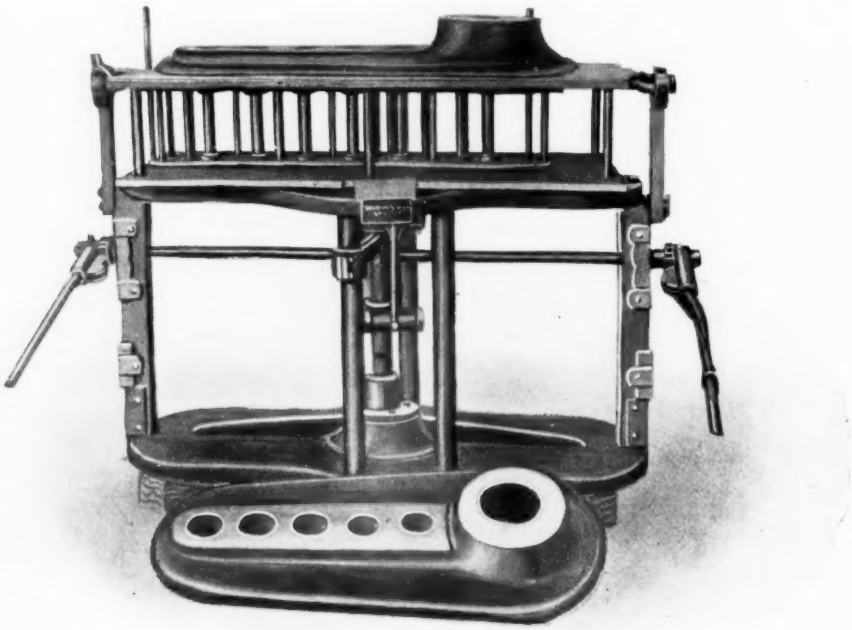


FIG. 1

THE HERMANN MOLDING MACHINE.

The Hermann Molding Machine.

The J. S. McCormick Co., of Pittsburg, have lately placed on the market the Hermann molding machine. This is one of the few machines that have been designed to ram the sand as well as draw the pattern from the mold. In its operation of ramming, the Hermann machine employs a principle

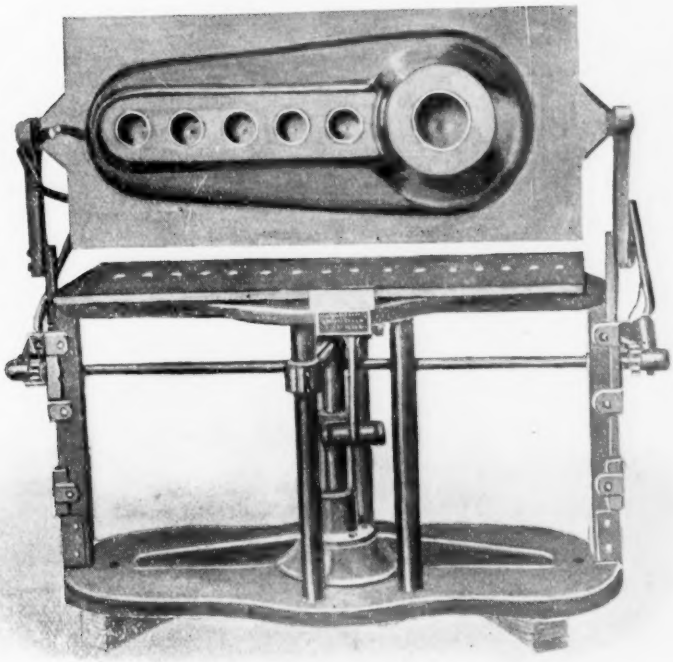


FIG. 2

THE HERMANN MOLDING MACHINE.

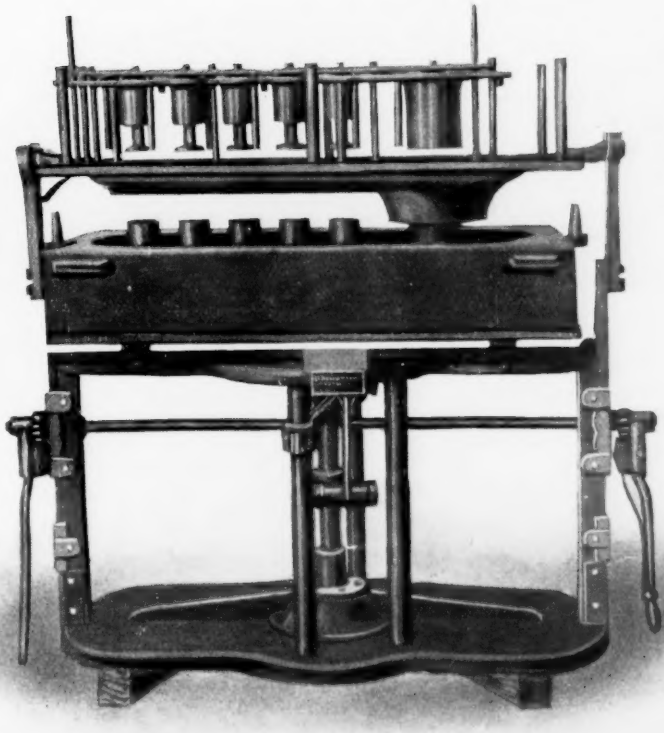


FIG. 3

THE HERMANN MOLDING MACHINE.

that has not before been applied to molding machines.

Almost any practical foundryman will, if he lets his thoughts turn backwards to his first days on the core-bench, remember how he knocked the core boxes for small cores against the bench, and in so doing rammed the core as well or better than he could do in any other way. This principle is carried out in the Hermann molding machine in the form of a jarring mechanism through the medium of which the mold is rammed automatically and uniformly.

For smaller machines the jarring or ramming mechanism is operated by hand, while machines intended for heavy or deep castings are operated by power. Any kind of flasks, either bench or floor, may be employed on this machine, though it is of course necessary that each set of flasks be interchangeable.

Fig. 1 shows the Hermann molding machine arranged for a flask measuring 18x40 inches and 6 inches deep. The casting made on this machine is a crank link, having six cores and weighing 253 pounds when cast. Fig. 2 shows the half pattern, which has been temporarily tilted on trunnions in order to afford a top view.

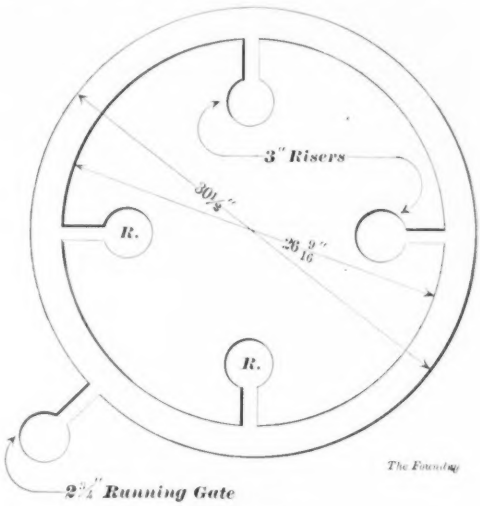
Fig. 3 shows the appearance of the machine after a mold has been made. That part of the pattern forming the cores shown is in this case made from phosphor bronze. No rapping is done in drawing the pattern, and the holes are consequently true to size.

The manufacturers announce that they will be glad to show the machine in operation and to furnish further particulars in regard to the class of work on which it can be used to advantage.

Porous Brass Castings.

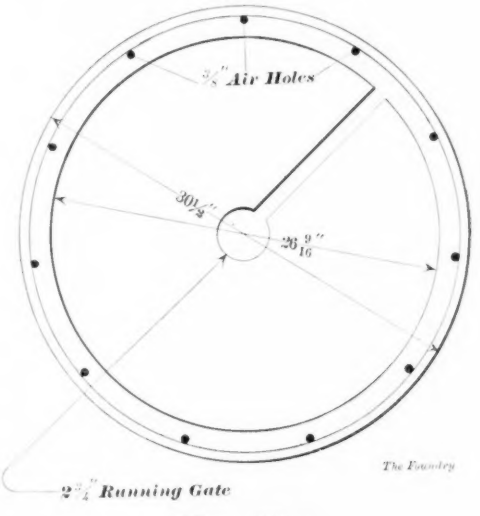
In the January number of THE FOUNDRY I noticed an article on Porous Brass Castings. Our works are a small concern, employing eight molders in the iron foundry and one in making brass castings. We manufacture elevators of every style—hand, belt, power, electric and hydraulic—besides side walk hoist and dumb waiters.

Our electric machines require a switch, which is made entirely of brass and copper. We have experienced a great deal of trouble with porous brass castings, especially in a bronze ring we make weighing two hundred pounds. Some five years ago the writer of this article was working on the floor making these rings and losing as many as he made good. In one week I have experienced a loss of as many as six of these castings. The defects would not be found



Old Way

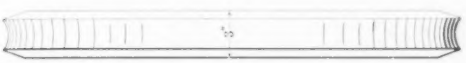
until the rings were taken from the foundry to the machine shop and put on the milling machine and a worm gear cut around the outside. About half way through the ring the cutters would strike these porous holes the size of a marble, while the outside would

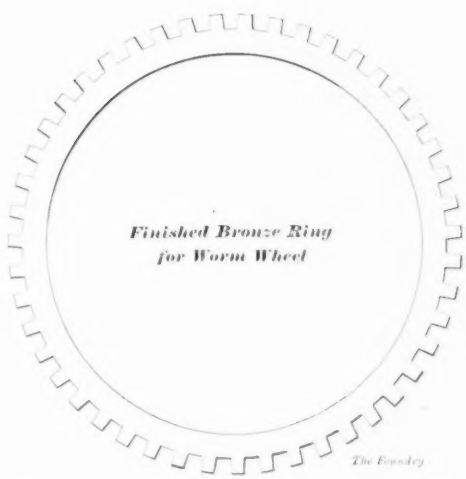


New Way

look perfectly sound, the consequence being that the casting would be thrown in the scrap pile after a good deal of machine work had been expended thereon.

One day the superintendent came into the brass shop and told the foreman that two more rings were bad and that if he could not do any better they would have to get them made some place else. Of course, after the superintendent went out the foreman jumped on the molder. Some foremen think they know it all, while there are a great many molders traveling around the country who could teach them a few things. If I have an apprentice who tells me something about a mold that I think is all right I will gladly thank him for it. I will explain why I write this way. In the first place, in making these bronze rings the foreman made me put four large risers and a pouring gate on them, the size of the gates being 3½ inches in diameter, with the gate cut to the bottom of the mold. Right where these gates were located one would find the porous spot. One day after losing a ring I said to the foreman that it seemed to me the risers were doing more harm than good on these castings, when he told me to "mind my own business," and "I am running this shop, not you." The consequence was, we continued to lose work, until they shipped the patterns to a shop near Philadelphia.





Finished Bronze Ring for Worm Wheel

Some two years after the above happened I was put in charge of the shop, and one day the superintendent came in to ask me if I thought I could get two castings for him for which they were in a great hurry, owing to some delay in shipping. I told him I would do the best I could, and I had the pleasure of turning out a perfect casting, since which time the firm has been making the castings themselves.

In order that the reader may better understand how the mere fact of gating these castings made and unmade the molder's work, I have appended illustrations showing the method employed in both cases, and also the appearance of the finished casting.

I suppose my foreman thought that these holes were caused from shrinkage, which was not the case. If he had stopped to think that phosphor bronze does not run as iron does, he would have seen his mistake. Bronze metal rolls over and over, and the air accumulates in the metal and has no chance to escape. By running a three-eighth inch rod through the cope every eight inches, as shown, a chance is offered this air to pass out of the mold.

A few remarks in regard to this plant, which was erected in 1850 by Knapp & Neal, who employed five men. In after years it became known as the Honesdale Iron Works. About six years ago Scranton and Honesdale capitalists took hold of the plant and to-day there are eighty men on the pay-roll. They are building an addition to the machine shop 50x80, two stories high, and are going to build a new foundry 50x120. They intend to double the capacity of the shop, which is on an average of twelve tons per week at the present time.

HENRY A. TINGLEY,
Foreman of Foundry of National Elevator & Machine Co., Honesdale, Pa.

Fires.

James E. Church's foundry at Holly, Mich., burned Feb. 27.

The Payne Co., Elmira, N. Y., had their plant almost destroyed March 8.

Rufus K. Jordan's foundry at Westbrook, Me., was damaged by a recent blaze.

The extensive plant of the Troy Malleable Iron Co., Troy, N. Y., was burned recently.

The Foundry of the Poorman Mfg. Co. at Piqua, Ohio, was totally destroyed Feb. 21.

The Western Foundry Co., Chicago, suffered a loss estimated at $50,000 in a recent fire.

The malleable foundry of the Stowell Mfg.

& Foundry Co. of South Milwaukee, Wis., burned Feb. 28.

The plant of the W. A. Jones Foundry & Machine Company, 51-55 South Jefferson street, Chicago, Illinois, was damaged by fire recently. The building in which the machine shop is located was practically destroyed, but the foundry escaped with little damage and there will be small hindrance in the continuation of their work. The damage was fully covered by insurance. Work on the new plant of this firm, which is now in process of construction, will be rushed to immediate completion so that as little delay as possible will occur in filling orders.

The Noble Separator.

We illustrate herewith the Noble Electro-Magnetic Separator which has been designed for the purpose of separating iron from brass borings, turnings, filings, in short from refuse of every description.

In these days of high-priced brass it becomes a distinct economy to use every ounce of metal which can be utilized. Practically old metal is as good as new but for the foreign substances which become mixed therewith. One of the most injurious of these is

iron, and the Noble Separator has after exhaustive trials been placed on the market as a reliable and durable device for removing this.

A dynamo is supplied with these separators, but where the purchaser can obtain a direct current the machines are furnished without the dynamo at a corresponding reduction in price. These machines have a great advantage over the so-called Permanent Magnet devices which become weakened after a time, making them ineffective and unreliable.

The Brass Founders Supply Company of Newark, N. J., are placing the Noble Separator upon the market and write us that its merits are giving them a ready sale.

The Weiss Molding Machine.

One of the latest molding machines to come forward for public favor and approval

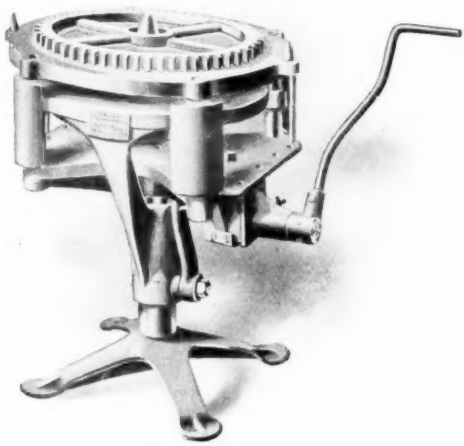


FIG. 1

is the "Weiss," built by the Maywood Foundry and Machine Co. of Maywood, Ill. They are of portable design and may be placed where most convenient to the molder.

Fig. 1 shows the general appearance of the Weiss Molding Machine, the one illustrated being designed for the molding of a gear wheel.

Fig. 2 shows another of the Weiss molding machines on which the operator seen in the illustration turns out two hundred molds a day, the size of the flask being 14x22 inches. The casting is shown on a larger scale at the left of the operator.

Fig. 3 gives a view of the patterns and plates used on the machine shown in Fig. 2.

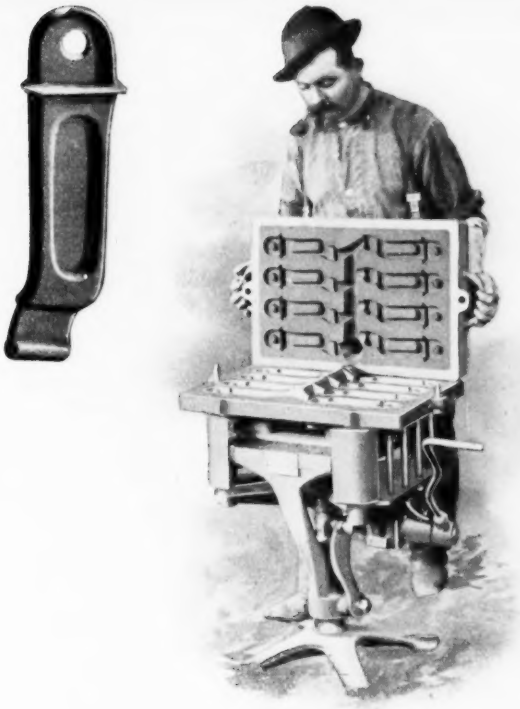


FIG. 2

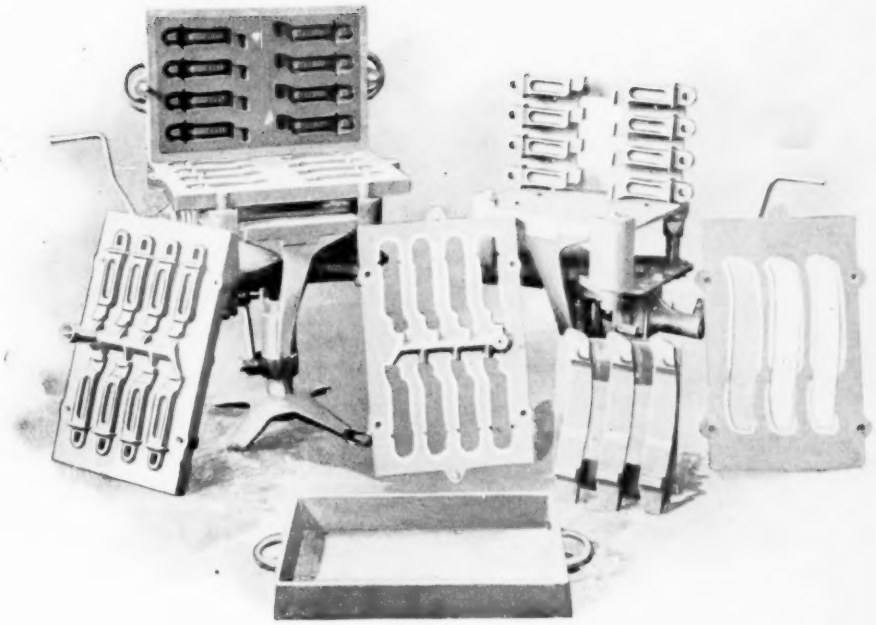


FIG. 3

On one machine the stripper plate and patterns have been removed to show the method of fastening the patterns. The plate at the left of the illustration shows stripper and pattern plate with gate ready to be mounted on machine.

The manufacturers assert that special care has been taken to protect all working parts against dust and sand and that the machines are built rigid enough to more than withstand any usage to which they may be subjected.

A Prominent Foundryman.

Mr. N. P. Bowler, senior member of Bowler & Co., Cleveland, Ohio, recently celebrated his eightieth birthday, and the occasion recalls to mind the long number of unbroken years Mr. Bowler has been connected with the foundry trade in Cleveland.

In 1853, in company with George W. Singer, Mr. Bowler entered the foundry and

N. P. BOWLER.

car wheel business, remaining until 1862, when he began business for himself. Mr. Bowler has been president of the Cleveland Frog and Crossing Co. and of the Cleveland Steel Casting Co. He was one of the original members of the Leslie Sewing Machine Co., which is now represented by the Standard Sewing Machine Co.

Among the Foundries.

Henry Binns is erecting a new foundry at Passaic, N. J.

J. C. Harker will erect a foundry at Grand Junction, Iowa.

Rhinehart Bros., of Perry, Iowa, have quit the foundry business.

F. M. Dean has started a foundry and machine shop at Omro, Wis.

The Phillips Mine Supply Co. of Pittsburg, will build a new foundry.

William F. Cromwell has leased the foundry located at Bedford, Pa.

The National Supply Co., of Toledo, Ohio, are building a new foundry.

A small foundry has been started in Derby, Conn., by George Thompson.

The Naugatuck (Conn.) Brass Co. has plans for a new foundry, 36x100.

Frank E. Jones is reported as intending to build a foundry at Stamford, Conn.

The Dain Mfg. Co. have begun operations in their new plant at Ottumwa, Iowa.

The Arizona & New Mexico Railroad has built a foundry at Clifton, Arizona.

Anderson Bros. of Bellaire, Ohio, are building an addition to their foundry.

The High Point (N. C.) Machine Works will double the capacity of its foundry.

C. A. Benbow is reported as intending to start a small foundry at Dayton, Wash.

The Sheffield (Ala.) Stove & Foundry Co. is erecting an additional warehouse, 50x100.

C. L. Tittle, of Johnstown, Pa., has recently made several additions to his plant.

O. S. Arrick and Wm. Fuerst have started a new jobbing foundry at Converse, Ind.

The Bickford & Huffman Co. of Macedon, N. Y., will build a new foundry 60x130 feet.

The Glenville (Pa.) Foundry and Machine Works has been purchased by T. A. Jenkins.

A. R. Bonn and H. Heidenreich have purchased the Gates foundry at Wilkesbarre, Pa.

The Union Foundry & Machine Co., of Rockford, Ill., will erect a new foundry, 60 x120.

Brantford, Ont., is to have a new industry, the Pratt & Letchworth Malleable Iron Works.

The American Foundry & Pipe Co., of Pittsburg, Pa., has filed articles of incorporation.

The plant of the Atherton Machine Co., at Lowell, Mass., is offered for sale by the assignees.

The Slater Engine Co., of Warren, Mass., has had plans prepared for an addition to its foundry.

The Dilley Foundry Co. of Pine Bluff, Ark., expect to increase their capacity in the near future.

The Hercules Iron & Supply Co. has increased the capacity of its foundry at Anniston, Ala.

The Western Electric Company, of Chicago, is building a new foundry and machine shop.

McKee, Fuller & Co., of Fullerton, Pa., are installing several compressed air cranes in their foundry.

The Morgan Engineering Co. of Alliance, Ohio, have let a contract for the erection of a new foundry.

Hill & Hethcott have leased the Beeson Foundry at Perry, Iowa, lately operated by Rhinehart Bros.

John R. Kirkpatrick, of Kendallville, Ind., contemplates the erection of a new foundry in the near future.

The Russel Wheel & Foundry Co., of Detroit, Mich., has increased its capital from $150,000 to $200,000.

Frank Buchanan has purchased an idle foundry at Lebanon, Pa., and will shortly place the sme in operation.

The Silver Bros. Iron Works Co., of Salt Lake City, Utah, are extending their plant and adding new equipment.

The plant of the Brooklyn Brass Mnfg. Co. at Martinsburg, W. Va., has been purchased by Hammond Hunter.

The Pittsburg (Texas) Foundry & Machine Co. have let a contract for the erection of a new foundry and machine shop.

The Neafie & Levy Ship & Engine Building Co. of Philadelphia have let the contract for the erection of a new brass foundry.

The Crescent Mnfg. Co. of Connellsville, Pa., is a new concern which will make a specialty of manufacturing plumbers' supplies.

W. H. Horrell and William Eastwood have formed a partnership to operate the Enterprise Iron & Brass Works, at Fort Worth, Texas.

Abendroth Bros. of Port Chester, N. Y., have had plans prepared for an extension to their works which will greatly increase their output.

Wm. Wharton, Jr., & Co. of Philadelphia, are making additions to and improvements in their plant which are estimated to cost about $15,000.

The James A. Brady Foundry Co. has been incorporated at Chicago with a capital of $15,000 by G. M. Davis, J. A. Brady and D. W. Buchanan.

The Clark Stove Company, of Kansas City, Kansas, has purchased a tract of land at Wichita and, it is reported, will there erect a stove foundry.

J. M. Summers of Wichita, Kansas, will erect a new foundry 50x125 feet to meet the increased demands on the trade by Oklahoma and Southern Kansas.

The Clinton Burnham Foundry Co. has been incorporated at Milwaukee by Clinton Burnham, Carroll M. Towne and George Lines. Capital stock, $55,000.

The Crompton & Knowles Loom Works of Worcester, Mass., are building an addition to their foundry 62x87 feet. The estimated cost of the improvement is $4,500.

The De Kosenko Manufacturing Co., of Philadelphia, have had plans prepared for a brass foundry to be located at Nineteenth and Hamilton Streets in that city.

Clerkin & Maag, furnace manufacturers, Akron, O., will build a large foundry next summer on the site of the old Schumacher Gymnasium plant, on West State street.

William De Mott has sold his interest in the firm of De Mott & Keys, at Central Ridge, N. Y., to S. Eckerson. The firm will hereafter be known as Keys & Eckerson.

J. E. Bell and Geo. W. Thompson have purchased the interest held by others in the Carthage (Mo.) Foundry & Machine Co. and are now the sole proprietors of that concern.

The Braid Bros. Company, Brooklyn, N. Y., has been incorporated to carry on a general foundry and machine shop and pattern shop business. The capital stock is $30,000.

The Athens (Ohio) Foundry & Machine Co. has been incorporated, with a capital of $20,000, by E. S. Jennings, E. F. Stocklin, L. L. Connet, L. W. Connet and T. Schramm.

W. H. Graves, formerly connected with Wallace & Graves, of Lafayette, Ind., will build a new plant at Delphi, Ind., to be known as the Graves Machine & Foundry Co.

It is rumored that the Blackloek Foundry, of South Pittsburg, Tenn., a concern closely affiliated with the Tennessee Coal, Iron & Railway Co., will at once double its capacity.

The Charleston Boiler & Foundry Co. has been organized at Charleston, W. Va., with a capital of $50,000, by E. Polsue, E. C. Polsue, H. Barton, Sr., H. Barton, Jr., and V. Pruth.

E. C. Weaver, superintendent of the Midvale Foundry Co., at Allentown, Pa., has purchased the site for a large plant which will shortly be erected and conducted as a foundry.

The Acme Foundry Co., of Reading, Pa., making a specialty of hardware novelties, began operations a short time ago. Harry Christensen and Adam A. Umholz are the proprietors.

The firm of Riddick & Durham of Kingston, N. Y., has been dissolved by mutual consent. The business will hereafter be conducted by Robert Riddick, Luther B. Durham retiring.

The South Bend Malleable Iron Company has been incorporated at South Bend, Ind., with a capital stock of $75,000. Directors: Clem Studebaker, John M. Studebaker and Edward T. Mauzy.

F. W. Miller, lately manager of the Miller Manufacturing Co., at Le Roy, N. Y., will start a manufacturing plant at Caledonia, N. Y., under the name of the Caledonia Bean Harvester Works.

The estate of P. D. Beckwith, manufacturers of stoves at Dowagiac, Mich., have made an offer to the village of Buchanan, Mich., to locate the furnace branch of their business at that place.

The plant of the Globe Foundry Co., at Worcester, Mass., will hereafter be known as the foundry department of the Morgan Construction Co., the latter concern having purchased the business.

A charter has been granted the Cherokee Foundry & Machine Works of Gaffney, S. C. The officers are: J. A. Carroll, president; J. O. Littles, vice-president, and W. C. Sarratt, secretary and treasurer.

Thomas Kelly, owner of the Economy Foundry at Oneida, N. Y., has taken into partnership his son, C. J. Kelly, and the business will hereafter be continued under the name of Thomas Kelly & Son.

P. H. Skidmon & Sons, owners of the Pacific Iron Works at Bridgeport, Conn., will double the capacity of their foundry, the new building being 75x164 feet. A 20-ton electric crane will be installed.

The Lakeside Stove Company, of Chicago, have been incorporated, with a capital stock of $2,500, to manufacture stoves and heaters. The incorporators are Andrew D. Burnett, J. R. Ward and William Rowlett.

The Kurtz Foundry Company, manufacturers of fine gray iron castings, 830 Austin avenue, Chicago, have added pattern making to their line of work, and are now prepared to attend to all orders in that line.

Edward Slater has sold his interest in the Slater Engine Co. of Warren, Mass., to his associates, Frank Slater and G. M. Faulkner. Mr. Slater had been the superintendent of the company since its organization six years ago.

The Standard Foundry and Mfg. Company, which purchased some time ago the idle foundry of the American Foundry Company, Cleveland, Ohio, will operate it to full capacity this year, and will considerably increase the output.

A. B. Day, vice-president and superintendent of the Fair-Day Foundry Co., at Knoxville, Tenn., has sold his interest in that concern to D. C. and William Richards. The new firm will continue operating the plant under the old name.

The Anderson Malleable Iron & Manufacturing Company, of Anderson, Ind., have been incorporated, with a capital stock of $75,000. The directors are Maurice S. Howe, John B. Latham, James Lynn, John F. Forkner and Chas. W. Becker.

The Shelby Machine & Foundry Co. has been organized at Shelby, Ohio, with the following officers: H. W. Hildebrandt, president; J. Landis, vice-president; Henry Wentz, treasurer, and G. W. Deyarmon, secretary and general manager.

The Greenville Foundry and Machine Works succeeds the Lone Star Engine and Boiler Works, at Greenville, Texas, and is a chartered institution, with a capital stock of $15,000. The incorporators are J. F. Moudy, A. E. McGary and H. T. George.

The addition, begun some time ago, to the foundry of the American Machine Co., Pawtucket, R. I., is nearing completion, when 50 men will be employed. Some delay

has occurred in this extension, owing to the inability of obtaining the iron work for the building.

The Columbus Malleable and Gray Iron Casting Co. is a new concern launched at Columbus, Ohio, by D. Birney Neil, president; Chas. A. Klie, vice-president; O. C. Klie, secretary and treasurer, and H. T. Irvin, general manager. The plant is expected to be ready for operation by May 1st.

The Manufacturers Foundry Co., of Waterbury, Conn., has purchased the foundry hitherto operated by Geo. B. Scoville, and will operate the same as soon as alterations now under way are completed. Henry D. Beach is president of the new concern. Mr. Scoville remains with the company as superintendent.

E. H. Bottum, E. Spence and F. W. Rogers have incorporated the Spence Manufacturing Company, with $25,000 capital, to manufacture plumbers' materials. The Lowens plant, at South Milwaukee, Wis., will be occupied by the company, and J. H. Spence, late of the Rundle & Spence Company, will be superintendent.

Codling Mfg. Company, Bristol, Conn., manufacturers of floor and ceiling plates for plumbers and fitters, are building a new foundry, 45x62 feet, with an L, 13x22 feet, equipped with modern appliances, and with a capacity somewhat greater than is required for their own castings. The new foundry is expected to be in early operation.

The Wm. H. Page Boiler Co. of Norwich, Conn., have leased the old Pequot foundry of the C. B. Rogers Co. at that city and will operate same in addition to their old plant. The Page Company have also purchased the plant of the Exeter Machine Co. at Exeter, N. H., which they will continue to operate in the manufacture of radiators, blowers, boilers, etc.

The Schill Bros., at Crestline, O., have organized a stock company, to be known as the Schill Bros. Co., with a capital of $100,000, to carry on the manufacture of furnaces and steel ranges. Messrs. Schill have been very successful, and the present company is organized so that a largely increased business of the past couple years can be properly taken care of.

Wilcox, Crittenden & Co., manufacturers of marine hardware, Middletown, Conn., are now equipping their plant with electricity for lighting and power purposes. Heretofore water and steam combined have been their motive power. They are installing a generator of about 150 horse-power, which will furnish power and light for their whole plant. The change in power has been made for economy as well as convenience.

The Edward P. Allis Company, Milwaukee, Wis., which have been spending about $500,000 for improvements on their plant, have already completed a big addition to their foundry, in which they will give employment to 125 additional men, and they now have under construction a large addition to one of their construction shops. This will soon be completed, and then work will begin on another shop that is to be more than 300 feet in length.

The B. Hoffman Manufacturing Company, which owns and operates an extensive iron and brass foundry at Milwaukee, Wis., and also manufactures plumbers' steam and gas-fitting material, has increased its capital stock from $75,000 to $150,000. The firm employed steadily 110 mechanics during 1899, to whom $55,000 in wages was paid. The officers are: B. Hoffman, president; August Seelman, vice-president, and Julius Kuehn, secretary and treasurer.

The work of doubling the size and capacity of the Central Foundry Company's soil pipe works, at Anniston, Ala., has been commenced, and is to be completed within sixty days. The additions to the buildings will give a main foundry building 100x500 feet and seven or eight other buildings of proportionate size. The output will be increased from thirty to forty tons a day, and the number of men employed from 200 to 400.

The car wheel foundry of the Southern Car & Foundry Company, at Anniston, Ala., which has been idle for several years, and which is the only idle department of the plant, is being overhauled and repaired and will be put in operation shortly. One hundred and fifty to two hundred additional men will be employed which, added to the 700 or 800 already in the other departments, will give a grand total of 900 or 1,000 men on the pay roll of the plant.

The plant of the East Chicago Foundry Co., which has been idle for some years, has recently been purchased by a new company,

and is undergoing a thorough renovating and rebuilding. The foundry has a daily capacity of 150 tons, being one of the largest in the vicinity of Chicago, and can make castings up to fifty tons. It is to be fully modernized and equipped with the latest improved machinery. It is expected that everything will be in readiness to begin turning out work in a few weeks. Many orders have been received and the start is auspicious.

A. Weiskittel & Son, iron founders and stove manufacturers, have contracted with the Structural Iron Company, of Baltimore, to erect a new iron foundry on the grounds where the firm's enameling works at Lombard and Thirteenth streets, Highlandtown, Md., are located. The building, it is said, will be one of the largest of the kind in the country, the dimensions being 120 feet wide and 350 feet long. The contract calls for its early completion, and it will be equipped with the latest machinery for the manufacture of enamel-lined bathtubs and other enameled plumbing goods. This plant will make the works of the Messrs. Weiskittel one of the largest and most complete in the United States.

The Birmingham (Ala.) Pipe & Casting Company has been incorporated by E. A. Abrams and H. K. Spencer, of Chester, Illinois, and J. F. Hatcher, of Columbus, Ohio, with a capital of $55,000. E. W. Abrams has been elected president and F. E. Glenn secretary. This company has purchased the long idle plant of the Baxter Stove Works, including a block of ground in the city limits, a number of buildings, engine, boiler, cupola, etc., and will convert the property into a soil pipe plant employing 150 hands and consuming forty tons of pig iron a day. The men interested operate hollow-ware works at Chester, Ill., Columbus, O., and other points, and will add the manufacture of iron kettles, etc., to the Birmingham plant later on. The new plant will be in operation on May 1.

J. S. Coxey, who owns extensive quarries at Pauls, Ohio, a few miles from Massillon, and well known to steel founders throughout the country through his silica sand, which is especially suitable for the molding of steel, lining of furnaces, etc., is erecting an iron foundry 30x100 feet which will be equipped with a five-ton roller bearing traveling crane and a 54-inch cupola. The iron foundry is built principally to furnish the cast iron work needed for the steel casting plant which Mr. Coxey will erect the coming spring, the main building of which will be 80x510 feet with wings 45 feet wide. Four electric traveling cranes having a capacity of 50, 30 and 15 tons will be employed, together with one 15-ton and one 25-ton acid open hearth furnace and four Duff's Gas producers. The plant will be up-to-date in every respect and capable of handling the heaviest work.

The Mesta Machine Company of Pittsburg lately made the first heat in the roll department at the new works at West Homestead, Pa. This is the last of the departments at the new plant to be put in operation. There are now running the ingot mold foundry, steel foundry, machine foundry, roll foundry and machine shop proper, but while running in part the departments are not completed and the entire plant will not be finished for some time yet. In the steel department a 43,000-pound steel casting is being made. In the roll foundry there are now completed a 15-ton and an 18-ton air furnace, while two 30-ton air furnaces are nearly completed, and the company is building two additional 15-ton furnaces and one additional 18-ton furnace, making seven air furnaces in all, with a total capacity of 141 tons. This gives it the largest capacity of any air furnace plant in existence. The steel department, which makes steel rolls also, is equipped with a 25-ton open-hearth steel furnace.

Personal.

Chas. Crastly has been appointed foreman of the foundry operated by Hockensmith & Co. at Irwin, Pa.

George W. Hull has been appointed foreman of the foundry at the Branford Lock Works, Branford, Conn.

John C. Knoeppel, foreman of the Ames Iron Works, Oswego, N. Y., was seriously burned in a recent accident.

Edward R. Euston has been appointed assistant superintendent of the North American Smelting Co. at Myerstown, Pa.

John S. Hyde has assumed the position of superintendent of the Bath Iron Works, Bath, Me., succeeding Chas. R. Hanscom.

Chas. H. Dring, for 32 years in the employ of Kilburn, Lincoln & Co., of Fall River,

Mass., the greater part of his time as foreman, retired recently. He is succeeded by John Davis.

Wm. M. Earles has resigned his position as foreman of the Lynchburg (Va.) Brass Mfg. Co.'s foundry to accept a similar position with the Whiting & Rosenberger Co. of Aberdeen, Md.

Deaths.

E. Crockett, a pioneer iron founder of Macon, Ga., died in that city recently.

Ezra C. Lamb, foreman of F. S. Lovell's foundry at Fitchburg, Mass., died Feb. 25, aged 47.

Nathaniel A. Boynton, president of the Boynton Furnace Co., Jersey City, N. J., is dead, age 77.

Leander J. McCormick, for many years a member of the McCormick Harvesting Machine Co. of Chicago, died there Feb. 20, aged 81.

Cupola Construction and Management.

BY L. C. JEWETT.

Answering some of the criticisms which have lately appeared in THE FOUNDRY on the so-called Jewett's cupola, I wish to say that the original sketch was made, and the article appearing with same written, soon after the writer had one of those pleasant, soul-inspiring, profanity-stimulating jobs of cleaning out the air chamber of a thirty-two inch Colliau cupola that had become filled with cinders, iron, etc.

The sheet forming the air chamber of the cupola, which is intended to be removable, was fastened with tapped bolts, and being in a place where rust doth corrupt to the extent that most of the bolt heads twist off, my position can be pretty well imagined, there being no man-hole in this cupola as there is in the larger and later built sizes.

My sole and principal purpose was to show in the sketch the best arrangement for an air chamber and tuyeres which has yet come under my notice, one that will allow more tranquil slumbers and less profanity on the part of foremen, molders and others engaged in the irritating task of cleaning the air chambers and tuyeres of the style in general vogue. I have used the type of tuyeres illustrated and spoke advisedly about them; in fact they speak for themselves.

Regarding the depth of tuyeres (30 inches) from the bottom of the cupola, I was asked a short time ago by a gentleman how high to put lower tuyere openings for a cupola lining up to fifty-four inches and intended to be used in running off heavy heats. I told him that I thought twenty-four inches would not be too high. Some four months after, I met the same party and inquired if he had placed his tuyeres at the height I recommended. He said that he had put them up fully that distance and wished that he had even raised them higher. When I asked him how the cupola worked, he answered, all right; carries the heat even through to the end with evident improvement to the iron. It is superior in softness, coming into contact as it does with the heated fuel in its transit through the deeper bed.

The slag hole is lower from the tuyeres and the slag is not cooled off so rapidly from the action of the wind as when the slag hole is placed immediately below the tuyeres. The slag flows very fluid, the height of the iron in the cupola before tapping out being regulated by the height of the slag hole, hence my dimensions as given on the sketch in question, although at the time my principal claim referred to the air chamber, location and shape of tuyeres.

Recently a prominent, practical and successful machinery jobbing foundryman told me that there was a disposition among foundries of his acquaintance to put more fuel on the bed than formerly, larger first charges, and also some increase on the second charge of iron.

Now suppose we analyze the depth of lower tuyeres, fuel in bed and size and angle of upper tuyeres. I would like to ask any experienced foundryman who has run a cupola, or, better still, a number of different types, as has been my sometimes sad and discouraging experience, as regards cleaning out tuyeres, putting in sand bottoms, daubing spouts, breasts and the like, even with thirty inches height from bottom of furnace, a good thick bottom of sand from the doors with a generous grade from rear of furnace to the tap hole, resulting in the complete draining of the iron from the cupola before dropping the bottom, insuring good thick sand over the doors and safety from run outs or cutting down to bottom of spout

near the tap hole as is liable and often does occur, with tap hole high enough for a liberal grade in the spout, with perhaps an inch or two more or less in thickness as to bed of fuel. I want to ask what would be the serious harm of all this and where is the sacrilege? One critic says the height above the tuyeres is the part of the fuel that does the melting trick, that part below as he contends acting simply as a support for the upper, heavy part of the material charged in the cupola above the tuyeres. Is this true? In coke, there is from 88 to 92 units of heat or some quantity approaching these figures, and some 90 odd per cent of carbon. Now when Mr. Oxygen gets to zephyring around among this crowd of heat units and percentages, what is to be the course of this volume of heat as it is generated? It is going up, of course, to be absorbed by the iron stock until the increased temperature produces disintegration and fusion and converts the iron into a liquid. Gravity causes it to trickle down through the fuel and to become rendered thereby hotter and more liquid. There has not been any way discovered to prevent the heat from going up in a cupola, and I have faith to believe that the heat units from the fuel in the cupola below the tuyeres will go up the same way. My trouble with low tuyeres has been, when high beds, to insure hot iron when required. Slow melting was the inevitable result as the point of combustion was raised so much higher. Would not the suggestion previously referred help to overcome this?

A word or two more regarding low tuyeres. I had a cupola in my charge once where the tuyeres were only about ten inches above the bottom doors and so low that but two inches of sand could be placed over the bottom. The cupola was twenty-four inches in diameter when lined, and under the circumstances we could not get more than 250 pounds of iron at a tap.

Concerning the upper three-inch tuyeres and the downward slant as shown by me in the sketch, would say that all Colliau cupolas that have ever come under my notice are built that way, perhaps not at this exact angle but an angle nevertheless. The sole purpose of these tuyeres is to furnish enough oxygen to ignite the carbon-oxide gas and hence economize so much more heat, or in other words, capture these heat units in their outward flight and absorb more work out of them, as it were.

Here is something worth a moment's thought in connection with liquids (air is a liquid) as an experiment. Put an indicating gauge on a pipe or hose through which water is flowing, hold a board in front of the outlet, but some two or three inches away. Never mind a little spattering but keep your eyes on the gauge. Notice what effect the liquid impinging on the board will have on the gauge. It will be seen that the pressure in the interior of the pipe has been increased through its being retarded. It is a well-known fact that rifle balls are deflected and have their directions changed through very small causes. What effect tuyere openings obstructed with coke and iron, wholly or partially closed, have on the exit of the wind is a difficult subject to follow. It is always advisable to have a liberal margin in the area of the tuyeres. If too small, you can take it out in perpetual growling and swearing; if too large or too many tuyeres, there is always plenty of mud in the poorest of regulated foundries. Do not be afraid to use it, judiciously of course.

I will recite the following upper tuyere story as one of my own experiences. Having taken charge of a foundry where a Colliau cupola thirty-two inches in diameter when lined was frequently used (this new one had been running but a few weeks upon my arrival there), they had considerable trouble with the running of it, it melted slow, very uneven and took two and a half hours or more to melt a five or six ton heat. The ladles were all bunged up each night and the melters were seized with an awful thirst when the bottom was dropped. All hands grunting, molders, core makers, melter and his helper, everybody had blood in his eye. Even the facing mixer said it wasn't worth house room, etc. Upon investigation, I found that the upper tuyeres were blocked tightly up with mud. The melter explained that this was due to the fact that they were n. g. I had them opened and changed the manner of charging, which resulted in some improvement, although hardly up to my expectations. After considering the matter awhile, I had a new set of upper tuyeres cast with an opening two and a half inches in diameter instead of the one and a quarter inches that came with the cupola from the

manufacturers and said by the melter to be useless. The new and larger upper tuyeres were placed in the cupola at the same angle as the original, and the whole thing was looked upon as the worst kind of desecration, sacrilege, etc. It resulted in heated chalk talks being pulled off at the noon hour in the shop and in the bar-rooms at night. It was proclaimed by all who knew anything about breaking iron or wheeling coke anyway that there would be so much tuyere area that the cupola would not melt at all. However, results talked louder than speech, and time and again we melted five tons with the new arrangement in fifty-five minutes. The wear and tear on the lining was no greater than the increased capacity of the cupola would warrant, and the bottom always dropped clean and bright.

Answering an inquiry in the March issue regarding the length of blast pipes and its influence upon the workings of a cupola, I think some facts were left unmentioned that are of more vital importance than the length of the blast pipe and influence the performance of a cupola far more.

I have been told by a prominent blower manufacturer that a distance of twenty feet was not injuriously near from blower to cupola. In my own experience I have found blast pipes in use having a length of from 15 to 150 feet without causing any comment as to their efficiency owing to their length. Again, we notice brick stacks made of large diameter to increase the draft, and the question naturally arises how does this increase the draft? The answer must be, through a reduction of friction.

All blast pipes from blower to cupola are more efficient if made, say, 33 per cent larger than area of blower outlet and area of tuyeres the same. Have from ten to fourteen ounces of pressure in the blast pipe, see that top of fuel is but at point of combustion before charging on your iron. Do not give extraordinary heavy burdens of iron until after careful experiments have shown what are the right proportions of fuel and iron charges. The iron, like the balloonist, must come downwards. If the above directions are followed the iron will come all right both as to temperature and speed.

I have heard of hanging bunches of cotton waste saturated with gasoline at the sides of a fan to enrich the air with gas, but electricity is something new. I believe better results will be realized from a moderately long blast pipe than from shorter lengths. The underlying principle of this is that a large area provides a surplus, which acts as a reservoir, a spring-cushion air chamber, as it were, causing a continuous flow of air and in case of tuyeres closing, as close they will, there will not be such a sudden call on the power that operates the blower. The increased area of blast pipe compensates for loss by friction of the air through pipe and tuyeres, a matter that, as far as I have learned from foundrymen, has received but little attention.

I once increased the length of a 12-inch wrought iron stack for a brass furnace to improve the draft. When finished I expressed regret that I had not made the extension twenty feet to make assurance doubly sure. An old experienced boilermaker said to me: "Young man, do you know, that unless enlarged, the length can be increased until there is no draft at all, not a blamed sight more, either?"

That fact I did not then know, but ever since I have given the factor, friction, respectful consideration and found it to be something that must not be ignored.

Notes on Foundry Practice.

BY EDWARD B. GILMOUR.

The foundry business is one of the trades that is so fascinating to outsiders as to make them think that if they were only engaged in that line they would make a fortune in a very short time, but invariably they find out their mistake, simply because they themselves do not understand the business. They generally employ a foreman who is recommended by some particular friend, or they have a relative who is a molder and a good talker and talks them into the business.

A man who undertakes the foundry business must be possessed of intelligence and forethought, he must be capable and ready for emergencies, open to conviction and not obstinate in character, willing to take the opinion of any one and weigh it in the balance, and decide at once the best course to pursue, and see that it is carried out. To a man with these capabilities the foundry business is very lucrative. Very little difference in a foreman either way makes a foundry a success or a failure, as the abilities of a foreman completely change the destiny of the

firm. I personally know of firms who had unlimited capital who are now out of business simply because of incapable foremen. The margin of profits in the foundry business is not so great as might be anticipated; every foundry does not produce its castings at the same price, in some places making the same class of work the cost of production varies as much as one-half cent per pound. Take for example if a foundry turns out 30,000 pounds of good castings per day, and taking the difference of cost at say one-fourth cent per pound, working twenty-five days per month, would give a saving of $75 per day, $1,875 per month and $22,500 per year. From this it is readily seen that it is possible to make money in the foundry and also how easy it is to lose it if the works are not handled judiciously.

It is not necessary that a molder should be possessed of a knowledge of chemistry, but if he has that knowledge it will be of unspeakable value to him, as he will be able more intelligently to understand the reason of the action of the different elements which he has to contend with in the pursuit of his business, and he will be able to buy the mtaerial best suited for his class of work in his own district at the lowest possible cost. There are some people who buy material at a high cost, bringing it a great distance, thereby adding heavy transportation charges, simply because they know that the material has a reputation. This is not necessary, as the resources of this country are so enormous that in almost every district material can be obtained which is suited for the foundry business. This holds good with all material used in the foundry; a good intelligent molder can upon looking at sand and clay very easily determine whether it is suited for the class of work which he has to make. In metallurgy we are indebted to Messrs. Keep and Turner for their valuable experiments and writings on the "Mechanical Analysis" of irons. It is possible to use cheap and good mixtures of iron for the various kinds of castings required; to know what is put into the cupola and what comes out under various conditions. A good foreman is always on the lookout watching the progress of his work to see if it is not possible to design some rigging whereby he can increase his output and reduce the cost of his castings. If they are making heavy loam work, he must regulate his work so that there is not too many large pieces coming forward at the same time. He must arrange the molders so as not to rush the cranes and ovens to excess at one time and at other times keep them idle, not for want of work, but for want of arrangements. He must also know the position of his men and know when their jobs will be completed, and not put too many men on molding a single casting, as in a great many instances they do not advance the piece in proportion to the extra expenditure added thereto. The most successful foundries are the ones that have adopted the system of divisional labor. It does not matter how intricate a piece is to make, if the employes work on this system they can be trained to make any class of castings with surety and at a great saving of time. Take for instance marine engine work, which is admitted to be the most intricate class of castings, in shops that make a specialty of this work it is usually arranged so that the molder who makes condensers always makes them, also the cylinders, and every piece is usually made on the same principle. I do not mean to say that the man who makes cylinders could not make condensers; he can make either of these pieces, but not so quickly or so perfectly as can be done with the continual experience which is gained on any one of these jobs when the best methods are brought out and the best results obtained. The same principle holds good all over the foundry, as the bench molder can produce better results who is skilled upon the bench than any one who only occasionally works at that branch of the trade.

The summing up of foundry management is simply that there must be a system adopted in everything, and nothing allowed to go by chance. This is the greatest secret of success in the foundry business.

The foreman should also possess the ability to control himself as well as his men. In so doing he will always command the respect of those under him. He ought to be thoroughly familiar with the work in every detail. As there is nothing gives more satisfaction in a foundry than the foreman being able to direct a job in a thorough, practical manner, he should never be too familiar

with his men as familiarity breeds contempt and he looses respect and control of his men. When he sees anything wrong in the shop he should be right there and give his orders and see that they are fulfilled. He should also be able to judge his men, their capabilities and dispositions, so that he can place them on the work best suited to them. He ought to handle his laborers on the same method as his molders; he must have a system in cleaning his shop, bringing in and taking out flasks, have a good supply of tools and a place to put them so that every one will know where to get them. No molders should be allowed to do any laboring work, as it costs too much and gives no satisfaction to the molder and less to the employer.

When a founder gets a foreman who can fill the bill he should always pay him good wages, as he will save him one hundredfold every day.

The Elimination of Phosphorus in Cast Iron.

For a number of years articles have appeared in the scientific press describing methods for the reduction of the phosphorus content in cast irons. Some of these have been very ingenious, but all have been very complicated and conditions were required for their successful performance which were hard to fulfil in ordinary foundry practice.

While experimenting along this line with a view to obtain a metal of high tensile strength from cheap material, it was the writer's aim to obtain, if possible, some method that could be used under the most ordinary circumstances, yet which would not entail special equipment or expense in attaining this end.

As a result, it was found by leaving the ashes of the wood—or still better of the charcoal, if this material was used in drying—in the ladle and allowing the metal, when tapped out from the cupola, to fall into this ash, that some of the phosphorus of the cast iron would go into this alkaline slag. This elimination of the phosphorus is much augmented by having the metal very hot when tapped out and by using a low sulphur coke with a clean alkaline ash No flux is used in the cupola other than the ash of the coke.

As to the amount of reduction obtained in the phosphorus content by this method, we can say that in a mixture carrying 0.58 per cent. of phosphorus the amount of this element was reduced to 0.30 per cent. and 0.32 per cent. respectively in two separate cases.

As to how much lower than this the reduction can be carried, the writer is not in a position to state, but it would logically follow that by agitating the metal in the ladle a still greater reduction would take place. However, the content of phosphorus could not be lowered, in all probability, to a very much greater extent, as it must be remembered with what persistence the traces of this element remain in the bath of the basic open hearth furnace, where all conditions are so much more favorable than they could possibly be in a ladle.—S. S. Knight, in Iron Age.

Running a Blast Furnace.

Few people who have not actually run a blast furnace realize what it means to fill the capacious maw of one of those monsters, says the "Engineering Magazine." A stack of 200 tons daily capacity, running on 50 per cent. ore, must have delivered to it each day something more than 400 tons of ore, 250 to 300 tons of coke, and over 100 tons of limestone, besides sand, coal and minor supplies—say 900 tons of raw materials. Add the 200 tons of pig iron product shipped out and we have a daily freight movement of 1,100 tons, taking no note of the disposition of the slag. The mining of the ore requires the labor of 150 to 300 men; the coal mining, coke making, quarrying of limestone and transportation, at least 300 more. The furnace itself employs about 150 or more hands. Starting up a furnace of ordinary capacity, therefore, calls immediately for the labor of nearly a thousand men; for the use of at least a thousand railway cars and many locomotives, for perhaps several steamers and vessels on the lakes; for capital, from the mines to the pig iron, of one to two millions of dollars, and last, but not least, for a high order of managing ability.

Use of Antimony.

Antimony is chiefly valuable as an alloy with other metals. It is used to a large extent with lead in the manufacture of type metal, to which it gives hardness, and, what is more valuable, it possesses the peculiarity, When used as an alloy, of expanding at the

moment of solidifying, thus giving to the type a clean, sharp impression. From 10 to 16 parts of antimony in 100 are used in making britannia metal. Pewter contains about 7 per cent. It is also used in the manufacture of babbitt metal, an anti-friction alloy used in the journals of railroad locomotives and cars and other rapidly-moving machinery. It has lately been used as an alloy with aluminium, to which it gives hardness and elasticity. Its effects on some metals are very injurious, particularly copper, an almost inappreciable amount (one part in a thousand), destroying its good qualities. The well-known medicinal preparation, tartar emetic, is a tartrate of antimony and potassium. The trisulphide is also used to some extent in medical practice. The sulphide was used to a considerable extent by the ancients as a pigment.—Exchange.

The Benefits of Consolidation.

Mathews & Co., in a circular on the prospects of the American Car & Foundry Co., say in part: "The economy of consolidation is nowhere more strikingly illustrated than in this corporation. By this means at least $350,000 per annum has been saved in the salaries of presidents, vice-presidents, treasurers and secretaries alone, for, instead of there being fourteen of these officials (one for each company), there is now but one for all, and the present salaries of the officials are not at all extravagant. The saving in the department of salesmen has been something enormous. Much useless expenditure of money by salesmen has been totally done away with. This item, where a dozen companies are competing for large orders in dull or even prosperous times, is a very considerable one, as all manufacturers will realize. We should estimate the total saving through consolidation, from all sources, for this company at more than $1,000,000 yearly. It is interesting to note that but for the rise in price for raw materials, the price to the consumer has not been affected by this particular consolidation."

A New England Bluff.

The stove manufacturers of Taunton do not look for a rush of business in their line this year, although they have been exceedingly busy the past year. The concerns now have on hand, with one exception, iron enough to last them into July, the exception being a concern which estimates it will run out in April, and all of them say they do not intend to purchase any more of a supply until all of the old is used, and if possible none until the tendency of the prices on pig iron is downward. They say that where iron is now double the price it was last year, there has been no appreciable advance in the prices of manufactured goods, and the manufacturer cannot see any hope of getting out of the business whole.—Exchange.

Pouring Two Kinds of Metal at the Same Time.

In our March issue we reprinted an item from a local paper announcing that Nathan Washburn, of Staffords Springs, Conn., had developed a new method of making car wheels. Writing us under date of Feb. 26, Mr. Washburn says:

"It is unnecessary for me to go into the history of car wheels from my first improved chilled cast iron car wheel invented by me in 1849. It is now universally used on all railroads in the country where cast iron wheels are used.

"The railroads have been calling for a steel car wheel that they can afford to use under their freight as well as under their passenger cars. I have a steel wheel that will fill the bill.

"The process of making my improved cast iron car wheel is entirely novel. I use a metallic mold in casting the wheel, which is poured with two kinds of metal at the same time, the hard metal in the rim or tread of the wheel and the soft metal in the center.

"After the wheel is cast it is taken from the mold and put into the converting furnace, where we keep the heat up with a hydrocarbon burner, the time of maintaining the heat depending upon the depth of the chill in the wheel. The rim of my wheel is a self-hardening steel and can be made any temper desired.

"The steel has great strength, stronger than any hammered or solid steel of the same temper.

"I will guarantee to save any railroad company one-half of their expense in wheels and a safer wheel than was ever made in the world.

"I have made a pretty broad statement, but nevertheless it is true. I am the oldest car wheel manufacturer living in this country. I think I know what I am talking about."

NOTICE!

Advertisements in this column, 30 cents a line for each insertion About seven words make a line. The Cash and Copy should be sent to reach us not later than the 20th to insure publication.

Answers addressed to our care will be forwarded

TO SUBSCRIBERS

whose names appear on our **subscription** list, we will give one free insertion under this heading to those in want of positions, the advertisement to occupy a space of not more than five lines. Additional space or insertions must be paid for in advance at regular rates.

FOR SALE.—A small foundry, machine shop and feed mill. Mrs. M. Ward, Newcomerstown, Ohio.

WANTED.—First-class second-hand No. 5 Pressure Blower. Address "H. B.," Box 387, care THE FOUNDRY.

WANTED.—Good second-hand 60 H. P. boiler and engine. Address "H. B.," Box 386, care THE FOUNDRY.

WANTED.—First-class molders; steady work, good pay. The W. K. Henderson Iron Works, Shreveport, La.

FOR SALE.—Foundry, machine shop and boiler works. Splendid opening. New building. J. A. Hamilton & Co., Algona, Iowa.

FOR SALE—One 3 to 4 ton jib crane, hand power. Blue print and price on application. JAMES LEFFEL & CO., Springfield, Ohio.

WANTED.—Position as foreman in foundry making bath tubs and plumbers' supplies. Address "Bathtub," Box 383, care THE FOUNDRY.

WANTED.—Position as foundry foreman in shop making machinery casting. Address for references "Machinery," Box 391, care THE FOUNDRY.

WANTED.—Modern cupola, second-hand; must be in good condition, about 48 inches inside lining. Address "H. B.," Box 385, care THE FOUNDRY.

FOR RENT OR SALE.—Foundry and machine shop with tools. Good building. Well located. Easy terms. Address F. D. Freeborn, Knoxville, Pa.

WANTED.—By an experienced foreman, a position in a large brass foundry making light or heavy castings. Address "Brass," Box 390, care THE FOUNDRY.

WANTED.—Molder for foreman in foundry, manufacturing pumps and cylinders. Prefer to let work by the ton. Address Davis-Hansen Company, Oshkosh, Wisconsin.

WANTED.—To correspond with parties using light gray iron castings in large quantities, with view of contracting for making same. Address Box 846, Macomb, Ill.

WANTED.—Cupola blower with engine connected by sliding base. Size equivalent to No. 7 or No. 8 Sturtevant. Address "Blower," Box 384, care THE FOUNDRY.

FOR LEASE—Foundry plant, admirably located in Detroit, in excellent repair; capacity two hundred moulders. Write Michigan Malleable Iron Company, Detroit.

WANTED—Good machinery molders accustomed to marine engine work. Steady work and good wages. Apply, Newport News Iron & Brass Works, Newport News, Va.

FOR SALE.—Self-contained engine patterns from 10 to 80 H. P., 18 to 20-ton cupola, good as new. Lot of engines and boilers, 15 to 250 H. P. One large blower. Armstrong Mfg. Co., Springfield, Ohio.

WANTED.—Position as assistant foreman in large gray iron shop by an experienced man. Employed at present, but would like a change. Used to hustling. Address "Assistant," Box 363, care THE FOUNDRY.

WANTED.—Foreman for medium-sized brass foundry, manufacturing plumbers' brass goods. Must be capable and experienced in every detail. Elegant position for right party. Address "Plumber," Box 388, care THE FOUNDRY.

WANTED—First-class molder as assistant foreman. None need apply unless capable of making good foreman. To an energetic and capable young man this is a good opportunity. Address "Assistant," box 366, THE FOUNDRY, Detroit, Mich.

WANTED.—Foundry foreman, a first-class man for shop making light work. State fully ability, experience, references, age and wages expected. Very good opportunity for the right man. Address "Light Work," Box 389, care THE FOUNDRY.

WANTED.—Foreman for foundry making furnaces and heating apparatus. Must have experience in furnace work. Be thoroughly posted in best cupola practice. Steady work for first-class man. Address Under Feed Furnace Co., Omaha, Neb.

WANTED—Assistant foreman under 40 years of age for a New England stove works. Must be experienced, competent, energetic and capable of managing men. First-class references required. Salary according to ability. Address, "Assistant," Box 372, care THE FOUNDRY.

FOR SALE.—Baker blower, 45 feet capacity per revolution, 6 year sold, now working daily under ¾ pound pressure at 100 R. P. M., fitted with pulley; will sell cheap. Also two No. 3 Roots' blowers, and one No. 2 Roots' blower, the latter three practically new machines. Address P. H. & F. M. Roots Co., 109 Liberty street, New York.

FOR SALE.—Bennett Bros.' Foundry. One of the best in New York State. Doing a good business, with capacity for considerable more, and good territory to draw from. Is fully equipped with tools, etc., etc., all of which go with the building.

is favorably known for quality of work, and is specially adapted for the higher grades of metals. Address Owner, 593 11th st., Brooklyn, N. Y.

FOUNDRY BLOWERS for sale. No. 1 Roots, improved style, excellent order, $115; No. 2 Roots, latest style, nearly new, $175; No. 7 Roots, improved style, good order, $560; No. 4½ Baker, perfect order, little used, $250; No. 6 Baker, perfect order, nearly new, $400. A. ASHER, 109 Liberty St., New York.

FOR SALE—Complete foundry outfit, consisting of one No. 3 Whiting Cupola, capacity 3 to 5 tons per hour. One No. 8 Buffalo Blower. One 2,500 pound, one 1,300 pound and one 225 pound ladles, Whiting make. Small engine and boiler, Crane, some patterns, flasks and other foundry tools too numerous to mention. Nearly new. Address, The Patterson Foundry and Machine Co., East Livernool, Ohio.

FOR SALE.—A complete line of steam boiler, flush and half arch fire fronts, smoke-box doors, lugs, manhead plates, connections, columns and the usual list of setting patterns, from 36 to 72 inches, used by first-class works, is offered for sale cheap. Whole outfit of patterns, flasks, core boxes, etc.; cost $3,000. Will sell for less than flasks alone could be made for. If you mean business, address "Patterns," Box 392, care THE FOUNDRY, Detroit, Mich.

A. F. Smith & Co., fire brick manufacturers, New Brighton, Pa., are overhauling their number one works and making some additions to their plant number two.

The Brooklyn Fire Brick Works of Brooklyn, N. Y., who had part of their works destroyed by fire a short time ago, have repaired the damaged portion and are again in full operation.

The Smooth-On Mnfg. Co. of Jersey City, N. J., are mailing a booklet to the trade describing the various Smooth-On compounds and their uses.

The S. Obermayer Company, Cincinnati and Chicago, announce that Mr. C. M. Barker, formerly with the Buffalo Foundry Supply Co., will hereafter represent the Obermayer Company, making his headquarters at St. Louis, Mo. The Obermayer Company reports a continually increasing export trade with a fair volume of domestic business.

Southern Iron Production.

Official figures on the shipment of pig iron from Alabama and Tennessee during the year 1899, according to a Birmingham dispatch, show a large increase over the movement of the previous year. The total for the past year amounted to 1,571,570 tons, an increase of 218,610 tons. Alabama furnished 80 per cent of this amount, and the Birmingham district forwarded 945,969 tons of the total, an increase over 1898 of 19,237 tons. Of this amount the Birmingham district furnished 57,230 tons, an increase of 12,708 tons.

Export iron shipments, practically all of which were furnished by the Birmingham district, amounted to 167,003 tons, a decrease from 1898 of 34,675 tons. Export pipe shipments were 11,742 tons. They came from the Bessemer plant of the United States Cast Iron Pipe Company and went mainly to the City of Mexico for water works.

The year 1900 commenced with barely 14,000 tons of pig iron in the furnace and warrant yards of Alamaba against about 175,000 tons in the same yards at the beginning of 1899, and in addition to this year also began with a productive capacity of the state increased over last year comparatively little. It is doubtful if several furnaces which are ready for the torch will be able to get into regular operation before spring. The Trussville, Talladega and Jenifer furnaces are ready for operation, but all three need raw material, which appears hard to get.

The only new furnaces put in blast last year were the Vanderbilt and the rehabilitated Alice furnaces. The new year saw two more go into blast, namely: The Gadsden furnace of the Alabama Consolidated Coal and Iron Company, and the Philadelphia furnace at Florence of the Sloss-Sheffield Steel and Iron Company. During the year it is expected that every idle furnace in the state will get to work, and that Alabama's output will be a million and a half tons as compared to 1,200,000 tons in 1899. Last year was the most notable year in the history of the iron industry in the South.

Getting Down to Business.

Allen Chadwick has finished work at the stock farm and is devoting himself wholly to foundry business.—Randolph (Vt.) Paper.